

Remedial Investigation Report For 903 Pad, Mound, and East Trenches Areas

Volume VII

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado

31 December 1987



| REVIEW ED | FOR CLASSIFICATION/UCNI |
|-----------|-------------------------|
| By | F. J. Curran |
| Date | 4-1-91 |
| | |

UNITED STATES DEPARTMENT OF ENERGY
ADMINISTRATION CONTRACT DE-AC04-76DPO3533

A-0U02-000

1987 MONITOR WELLS

EXPLANATION OF SYMBOLS AND TERMS ON BORING LOGS

SAMPLE TYPE

 \boxtimes

Split Spoon



NC Core



Continuous Drive



Bulk

GRAPHIC LOG



Clay or Claystone



Clayey Sand or Sandy Clay



Silty Claystone



Cobbles and/or Gravel



Sand and Sandstone



Sand and Gravel



Silt or Siltstone

PENETRATION RESISTANCE

6/6

Standard Penetration Test Results Blows Per Inch.

INDEX OF DATA

| Boring No.: 9-87BR/BH29-87 | | | |
|----------------------------|----------------------------------|--|--|
| Completed as well? Yes | | | |
| Data in File | | | |
| X | Log of Borehole | | |
| <u> </u> | Well Construction Summaries | | |
| | Well Development Summaries | | |
| <u> </u> | Hydraulic Conductivity Test Data | | |
| | and Results | | |
| | Packer Test Data and Results | | |
| <u>X</u> | Water Level Data | | |

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 9-87BR/BH29-87 Coordinates N 36080.84 E 22239.33 Ground Surface Elevation 5980.22' Total Depth 37.50' Water Level Encountered 17.50' Static 5963.42' (12/01/87) Driller R. Sharp Drilling Company Boyles Bros T. Merritt Date Drilled June 12, 1987 Helper Drilling Method Hollow Stem Auger Drilling Fluid Logged By J. B. Bergman Checked By 1 Geologist Site Manager en-CEARP Manager Comments (00 N/c | 100 N/c | Samples Collected or Lithologic Description Other Tests Performed **TOPSOIL** HNu Background=0.6 OVA Background=0.8 0.0-1.5' SAMPLE. No readings over Recovered 1.45/1.5' = 76%. background. 0.0 - 0.5': TOP SOIL: grayish brown (5 YR 3/2); abundant roots and grasses; sandy 0.0-10.0': Composite sample: BH29870010. clay and gravel; unconsolidated; dry. **ROCKY FLATS ALLUVIUM** 5.0': Field screen 5 readings: HNu = 0.80.5 - 1.45': COBBLES AND GRAVEL: (BG); OVA=1.8 (BG).pink and gray quartzite and granite in a clay matrix: pale yellowish brown (10 YR 9.70-12.70': Contact 6/2); unconsolidated; angular; dry. sample: BH298713CT. 1.5-3.0' SAMPLE. 10.0': Field screen Recovered 1.65/1.5' = 110%. readings: HNu = 0.8CLAYEY GRAVEL: pink and gray gran-(BG); OVA = 1.810 ite and quartzite in a moderate yellowish (BG). brown (10 YR 5/4) matrix; sandy; unconsolidated; unsorted; dry. 15.0': Field screen readings: HNu = 0.83.0-4.2' SAMPLE. (BG); OVA = 1.8Recovered 1.0/1.2' = 83%. (BG). CLAYEY GRAVEL: same as above; dry. 15.70-16.80': Bedrock 4.2-5.0' SAMPLE. sample: BH298716BR. Recovered 1.5/0.8' = 188%. 15 17.50-18.50': Water CLAYEY GRAVEL: same as above; dry. table sample: 5.0-6.0': No recovery. Lost core. BH298717WT. 6.0-7.5' SAMPLE. 20.0': Field screen Recovered 0.6/1.5' = 40%. readings: HNu = 0.2 SILT: pale yellowish brown (10 YR 6/2); (BG); OVA = 1.8cobble; distorted quartzite sample (BG). (cuttings from center bit); dry.

_ of_

20

| Coordinates Total Depth Drilling Com Date Drilled Drilling Met | June 12, 1987 hod Hollow Stem Auger J. B. Bergman Geologist | Ground Surfa | None None |
|--|---|---|--|
| 20 | 7.5-9.5' SAMPLE. Recovered 2.0/2.0' | | Samples Collected or Other Tests Performed |
| <u>25</u> | ish brown (10 quartzite and gr medium-grained s rounded; dry. 9.5-12.5' SAMPLE. Recovered 2.0/3.0' | AVEL: same as above; | 25.0': Field screen readings: HNu = 0.2 (BG); OVA = 1.8 (BG). |
| <u>30</u> | Recovered 2.0/2.5' 12.5-12.7': SAND A above; moist. ARAPAHOI 12.7-13.8': SANDS YR 6/4); very fine sorted; wet. 13.8-14.5': SANDS brown (10 YR 6 | = 80%. AND GRAVEL: same as E FORMATION TONE: light brown (5 grained; rounded; well FONE: pale yellowish /2); quartzose; coarse | 30.0': Field screen readings: HNu = 0.2 (BG); OVA = 1.8 (BG). |
| 35 | well sorted; med dated; moist. | = 72%. owish gray (5 Y 8/1); ium grained; consoli- | 35.0': Field screen readings: HNu = 0.2 (BG); OVA = 1.8 (BG). |
| 40 | | | |

| Coordinates N 36080.84 D 22239.33 Ground Surface Total Depth 37.50' Water Level | rritt None |
|--|--|
| Lithologic Description | Samples Collected or Other Tests Performed |
| 20.0-22.5' SAMPLE. Recovered 1.5/2.5' = 60%. SANDSTONE: pale olive (10 Y 6/2); medium-grained; well sorted; few moderate yellowish brown (10 YR 5/4) stains; rounded; wet. 22.5-25.0' SAMPLE. Recovered 1.5/2.5' = 60%. SANDSTONE: same as above; wet. 25.0-27.5' SAMPLE. Recovered 2.2/2.5' = 88%. SANDSTONE: same as above; wet. 27.5-30.0' SAMPLE. Recovered 0/2.5' = 0%. 30.0-32.5' SAMPLE. Recovered 2.5/2.5' = 100%. 30.0-30.5': SANDSTONE: same as above. 30.5-31.5': SANDSTONE: moderate brown | |
| (5 YR 4/4); chert and quartzite; very coarse-grained; well to moderate sorting; wet. 31.5-31.7': CLAYSTONE: light olive gray (5 Y 5/2); sandy; consolidated, moist. 31.7-31.9': SANDSTONE: light olive gray (5 Y 5/2); and moderate brown (5 YR 4/4); well sorted; wet. 31.9-32.5': CLAYSTONE: light olive gray (5 Y 5/2); sandy; consolidated; moist. | |

Page __3

| Coordinates N 36080.84 E 22239.33 Total Depth 37.50' Water Lev Drilling Company Boyles Bros Date Drilled June 12, 1987 Drilling Method Hollow Stem Auger Logged By J. B. Bergman Checked B | Merritt Wone None |
|--|--|
| Geologist | Site Manager CEARP Manager |
| Comments | |
| Lithologic Description | Samples Collected or Other Tests Performed |
| 32.5-35.0' SAMPLE. Recovered 2.8/2.5' = 112%. CLAYSTONE: light brown (5 YR 5/and light olive gray (5 Y 5/2); some light brown (5 YR 5/6); mottles; consolidate trace organics; moist. 35.0-37.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above; sandy top 0.5' and in shoe; moist. TOTAL DEPTH: 37.50' | ht d; |
| | |
| | |
| | Page 4 of 4 |

WELL COMPLETION INFORMATION

Coordinates N 36080.84 F 22239.33

Well No. <u>9-87BR</u>

Total Depth: Well 32.40'

Elevation: Ground Surface 5980.22'
Top of Casing 5981.72'

Borehole 37.50'

Formation of Completion Arapahoe Formation

Casing MaterialSch 5, type 316 TFJ stainless steel

Screen Material 0.010" wire wrap, type 316 TFJ
Date installed June 15, 1987 stainless steel

installed By J.B. Bergman Geologist

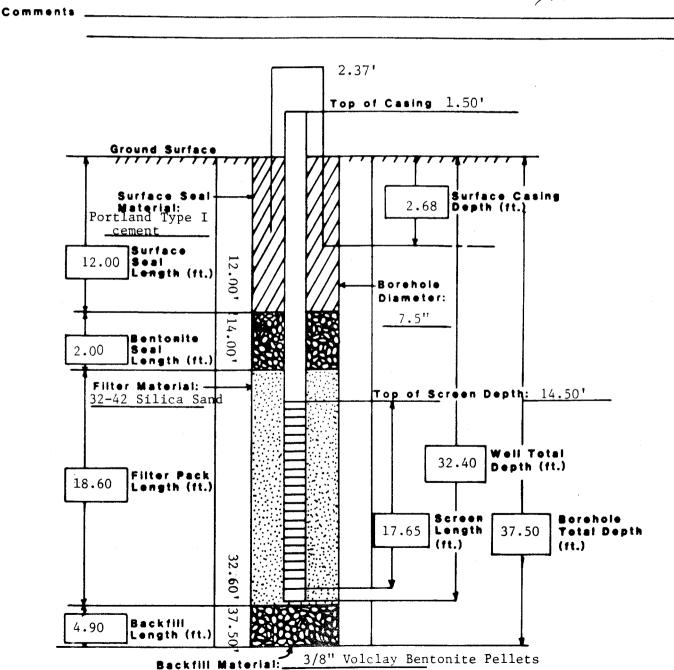
Casing Diameter _2" ID

Surface Casing Diameter 5" ID

Approved By

But Site Manager

CENTP Manager



PROGRAM SLUGT, VERSION 4.0CT, 1985

THIS FROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3, NO.1 OF WRR ENTITLED *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER*)
- (2) METHOD OF BOUMER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF MRR ENTITLED
 "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS
 WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-9-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 9-87 Run #1

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH

DIAMETER OF DRILLED HOLE = 7.50 INCHES

THICKN

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 51

LENGTH OF SCREEN OR INTAKE PORTION = 15.55 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 15.55 FEET
THICKNESS OF SATURATED AGUIFER ZONE = 14.90 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING."0" IF RISING)

| (sec | (FEET) |
|--------------|---------|
| | |
| 1.00 | 1.060 |
| 2.00 | .980 |
| 3.0 0 | .910 |
| 4.00 | . 850 |
| 5.00 | .800 |
| 6.00 | .750 |
| 7.00 | .710 |
| 8,00 | .670 |
| 7.00 | .540 |
| 10.00 | .600 |
| 11.00 | .570 |
| 12.00 | .540 |
| 13.00 | .510 |
| 14.00 | . 480 |
| 15.00 | . 460 |
| 16.00 | .440 |
| 17.00 | .420 |
| 18.00 | .400 |
| 19.00 | . 380 |
| 20.00 | . 360 |
| 21.00 | ,340 |
| 22.00 | .330 |
| | |
| 23.00 | ,310 |
| 24.00 | .300 |
| 25.00 | .290 |
| 26.00 | . 280 |
| 27.00 | . 260 |
| 28.00 | . 250 |
| 29.00 | . 240 |
| 30.00 | . 230 |
| 31.00 | . 220 |
| 32.00 | .210 |
| 33.00 | .210 |
| 34.00 | .200 |
| 35.00 | .190 |
| 40.00 | . 150 |
| 45.00 | .130 |
| 50.00 | .110 |
| 55.00 | .090 |
| 60.00 | .080 |
| 65.00 | .070 |
| 70.00 | .060 |
| 75.00 | .050 |
| 80.00 | .040 |
| 85.00 | .040 |
| 94.00 | .030 |
| 104.00 | .030 |
| 114.00 | . 020 |
| 126.00 | .020 |
| 146.00 | .010 |
| 176.00 | .010 |
| | • • • • |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

.6760

.7291

.7533

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.00E-04 FT/sec = 3.05E-03 CM/sec

TRANSMISSIVITY = 1.49E-03 FT##2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 3.22E-05 FT/sec = 9.80E-04 CM/sec

TRANSMISSIVITY = 4.79E-04 FT##2/sec

PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3.NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF NATER")
- (2) METHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED ARRIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-9-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 9-87 Run #2

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH

DIAMETER OF DRILLED HOLE = 7.50 INCHES

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 39

LENGTH OF SCREEN OR INTAKE PORTION = 15.55 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 15.55 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 14.90 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING,"0" IF RISING)

| TIME | HEAD |
|--------|--------------|
| (sec) | (FEET) |
| | |
| 1.00 | . 970 |
| 2.00 | .910 |
| 3.00 | . 850 |
| 4.00 | . 800 |
| 5.00 | .750 |
| 6.00 | .70 0 |
| 7.00 | . 660 |
| 8.00 | . 630 |
| 9.00 | .590 |
| 10.00 | . 560 |
| 11.00 | .530 |
| 12.00 | .500 |
| 13.00 | .470 |
| 14.00 | . 450 |
| 15.00 | . 420 |
| 16.00 | . 400 |
| 17.00 | . 380 |
| 18.00 | . 360 |
| 19.00 | .350 |
| 20.00 | . 330 |
| 21.00 | .310 |
| 22.00 | .300 |
| 23.00 | . 290 |
| 24.00 | .270 |
| 25.00 | .260 |
| 26.00 | .250 |
| 27.00 | .240 |
| 28.00 | .230 |
| 29.00 | .220 |
| 30.00 | .200 |
| 35.00 | .160 |
| 40.00 | .130 |
| 45.00 | .110 |
| 50.00 | .090 |
| 55.00 | .070 |
| 60.00 | .060 |
| 70.00 | .040 |
| 80.00 | .020 |
| 90.00 | .010 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> .9027 .8865

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.37E-04 FT/sec = 4.17E-03 CM/sec

TRANSMISSIVITY = 2.04E-03 FT++2/sec.

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 4.39E-05 FT/sec = 1.34E-03 CM/sec

TRANSMISSIVITY = 6.55E-04 FT**2/sec

PROGRAM SLUGT, VERSION 4.0ET. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADDPULDS, 1967 (ARTICLE IN VOL.3, NO.1 OF WER ENTITLED *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF MATER*)
- (2) METHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF MRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-9-87

FIELD INVESTIGATOR: Kevin McMeill

WELL NO.: 9-87 Run #1 5

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH
DIAMETER OF DRILLED HOLE = 7.50 INCHES

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 50

LENGTH OF SCREEN OR INTAKE PORTION = 15.55 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 15.55 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 14.90 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING, "0" IF RISING)

| TIME (sec) | HEAD (FEET) |
|----------------|----------------|
| 1.00 | 1.030 |
| 2.00 | . 960 |
| 3.00 | .900 |
| 4.00 | .840 |
| 5.00 | .790 |
| 6.00 | .750 |
| 7.00 | .710 |
| 8.00 | .670 |
| 9.00 | . 630 |
| 10.00 | .600 |
| 11.00 | .560 |
| 12.00 | .540 |
| 13.00 | .510 |
| 14.00 | . 480 |
| 15.00 | . 460 |
| 16.00 | .440 |
| 17.00 | . 420 |
| 18.00 | .400 |
| 19.00 | .380 |
| 20.00 | .360 |
| 21.00 | . 350 |
| 22.00 | .330 |
| 23.00 | .320 |
| 24.00 | .300 |
| 25.00 | .290 .280 |
| 26.00 27.00 | .280 |
| 28.00 | .270 |
| 29.00 | . 250 |
| 30.00 | .240 |
| 31.00 | .230 |
| 32.00 | .220 |
| 33.00 | .210 |
| 34.00 | .200 |
| 35.00 | .200 |
| 40.00 | .160 |
| 45.00 | .140 |
| 50.00 | .120 |
| 55.00 | .100 |
| 60.00 | .090 |
| 70.00 | .070 |
| 80.00 | . 050 |
| 91.00 | .050 |
| 111.00 | .030 |
| 135.00 | .030 |
| 155.00 | .020 |
| 175.00 | .020 |
| 205.00 | . 020 |
| 235.00 | .010 |
| 250.00 | .010 |
| | |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> .5264 .5471

METHOD OF BOUNER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 6.00E-05 FT/sec = 1.83E-03 CM/sec

TRANSMISSIVITY = 8.94E-04 FT+=2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.93E-05 FT/sec = 5.88E-04 CM/sec

TRANSHISSIVITY = 2.87E-04 FT##2/sec

12/11/87

Water Level Data for

Rockwell (Rocky Flats)

| Date Measured | Depth to Water from TOC | Elevation TOC (ft) | Water Level Elev. (ft) |
|------------------|-------------------------|-----------------------|---------------------------|
| | | | |
| ** Well Number | : 0987BR | | |
| 08/04/87 | 17.50 | 5981.72 | 5964.22 |
| 12/01/87 | 18.30 | 5981.72 | 5963.42 |

INDEX OF DATA

| Boring No.: 10-87 | | | |
|------------------------|----------------------------------|--|--|
| Completed as well? Yes | | | |
| Data in | File | | |
| X_ | Log of Borehole | | |
| <u> </u> | Well Construction Summaries | | |
| | Well Development Summaries | | |
| | Hydraulic Conductivity Test Data | | |
| | and Results | | |
| | Packer Test Data and Results | | |
| X | Water Level Data | | |

| Location Rocky Flats Plant; 903 Pad Area | Borehole/Well | |
|--|----------------------------|--|
| Coordinates N 35959.99 E 22180.04 | Ground Surfac | • Elevation 5981.96' |
| Total Depth 17.00' | | incountered None |
| | : | Static5970.68' |
| Drilling Company Boyles Bros | Driller D. Ja | |
| Date Drilled June 15, 1987 | Helper K. Pa | |
| Drilling Method Hollow Stem Auger | Drilling Fluid | |
| | - | |
| Logged By C. J. Wood Geologist | Checked By <u>C</u> | / Site Manager |
| 500,04,00 | , | Brent Reus |
| | _ | CEARP Manager |
| Comments | | |
| | | |
| Lithologic Des | cription | Samples Collected or Other Tests Performe |
| DOCKY FLATS | * * **** | HNy Packground-0.0 |
| ROCKY FLATS A | LLUVIUM | HNu Background=0.0 OVA Background=0.0 |
| 0.0-2.0' SAMPLE. | | Ludlum Background |
| Recovered $1.0/2.0^{\circ} = 50\%$ | | = 0.0 |
| SANDY CLAY: modera | • | No readings over |
| 4/4); numerous quartz | | background. |
| cobbles; some roots; dry. | | · |
| 5 2.0-4.0' SAMPLE. | | |
| Recovered $0.6/2.0' = 30\%$ | | |
| GRAVELS: quartzite pet | | |
| dry. | | |
| * * * * * * * * * * | • | |
| 4.0-5.0' SAMPLE. No rec | overy. Lost core. | |
| 5.0-7.0' SAMPLE. | | |
| Recovered $2.0/2.0' = 1009$ | %. | |
| 10 SANDY CLAY: light oliv | ve gray (5 Y 6/1) | |
| to moderate reddish ora | | |
| 1000000000000 | cite throughout; | |
| numerous quartzite pebl unconsolidated; damp. | oles and coodles, | |
| January, damp. | | |
| 7.0-9.0' SAMPLE. | | |
| Recovered $2.0/2.0' = 1009$ | | · |
| SAND: light gray (N 7 | | |
| reddish orange (10 R clay; numerous quartzit | | |
| gular to subrounded; ca | | |
| damp to dry. | in the same and a same and | |
| | | |
| | | |
| 1 1 1 | | |
| | | . |
| + + + | | |
| 20 | | |

| Location Rocky Flats Plant; 903 Pad Area | Borehole/Well No. 10-87 | |
|---|---|--|
| Coordinates N 35959.99 E 22180.04 | Ground Surface Elevation 5981.96' | |
| Total Depth 17.00' | Water Level Encountered None | |
| | Static | |
| Drilling Company Boyles Bros | Oriller D. Jarvie | |
| Date Drilled June 15, 1987 | Helper K. Parker | |
| Drilling Method Hollow Stem Auger | Drilling Fluid None | |
| Logged By C. J. Wood | Checked By Dascho | |
| Geologist | Site Manager | |
| | CEARP Manager | |
| | CEARP manager | |
| Comments | | |
| | | |
| Lithologic Desc | / | |
| Lithologic Desc | /Samples Collected or ription Other Tests Performed | |
| / ° 4 / ° 4 / ° 4 / | | |
| | | |
| 9.0-11.0' SAMPLE. | | |
| Recovered 1.5/2.0' = 75%. | . 4424 | |
| 9.0-10.5': SAND: moderate (10 R 6/6); weathered; nu | | |
| pebbles; medium to coars | | |
| caliche; damp. | granter, mark | |
| | | |
| ARAPAHOE FOR | MATION | |
| — + + + 110 1201 CAN (F) F | | |
| $\frac{11.0-13.0' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 100\%}$ | | |
| SILTY CLAYSTONE: m | | |
| orange (10 R 6/6); iron | T I | |
| gray (N 7/0) in areas; dan | np to dry. | |
| + + + | | |
| $\frac{13.0-15.0' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 100\%}$ | | |
| SANDY-SILTY CLAYST | | |
| , i i | reddish orange (10 R 6/6); iron staining; | |
| light gray areas (N 7/0); c | iamp. | |
| † † † 150 1701 GAARDY F | | |
| $\frac{15.0-17.0' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 100\%}$ | | |
| SANDY-SILTY CLAYSTO | | |
| † † (N 7/0) to moderate redd | ish orange (10 R | |
| 6/6); trace calcite; dry to | damp. | |
| TOTAL DEPOSIT 17.00 | | |
| TOTAL DEPTH: 17.00' | | |
| ↓ ↓ ↓ | | |
| | | |
| + + + | | |
| | | |
| † † † | | |
| ↓ ↓ ↓ | | |
| | | |
| | Page 2 of 2 | |
| | · - 3 | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 903 Pad Area Coordinates N 35959.99 E 22180.04

10-87 Well No.

Elevation: Ground Surface 5981.96'

Total Depth: Well 12.00'

Top of Casing 5983.53'

Borchole _17.00' Formation of Completion _ Rocky Flats Alluvium

Casing Material Sch 5. type 316 TFJ stainless steel Casing Diameter 2" ID

Screen Material 0.010" wire wrap, type 316 TFJ stainless steel Date Installed _ June 15. 1987

Geologist

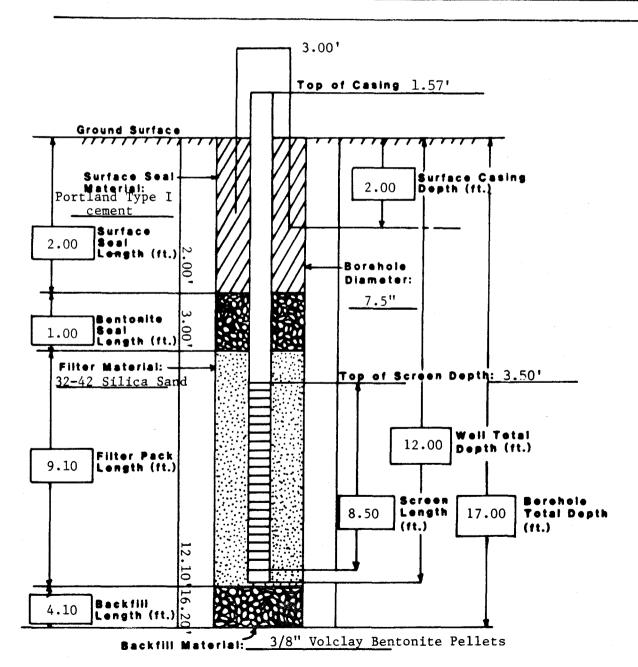
Surface Casing Diameter 5" ID

installed By C.J. Wood

Approved By

pm3 CEARP Manager

Comments __Centralizer at 7.35 to 8.50'



12/11/87

Water Level Data

for

Rockwell (Rocky Flats)

| Date | Depth to Water from TOC | Elevation | Water Level |
|--|-------------------------|-----------|-------------|
| Measured | | TOC (ft) | Elev. (ft) |
| and the second s | | | |
| ** Well Number | : 1087 | | |
| 08/04/87 | -1.00 | 5983.53 | 5970.68 |
| 12.01/87 | 12.85 | 5983.53 | |

INDEX OF DATA

| Boring | No.: 10-87BRA |
|------------|----------------------------------|
| Comple | ted as well? No |
| Data in | File |
| <u>x</u> _ | Log of Borehole |
| | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| | Water Level Data |

| Location | Rocky Flats Plant; 903 Pad Area Borehole/Well | No. <u>10-87BRA</u> |
|-----------------|---|--------------------------|
| Coordinate | Ground Surfac | e Elevation |
| Total Dept | h 53.00' Water Level | Encountered 28.30' |
| | | Static N/A |
| Drilling Co | mpany Boyles Bros Driller D. Ja | arvie |
| Date Drille | d <u>June 12, 1987</u> Heiper <u>K. Pa</u> | |
| Drilling Me | thod Hollow Stem Auger Drilling Fluid | |
| | C. J. Wood Checked By_ | |
| | Geologist | /Site Manager |
| | - | Drent Bears |
| | Borehole backfilled with Portland Type [cement | ÆEARP Manager |
| Comments | Decision Marie Por Caracter 1770 1 Caracter | |
| | | |
| | / | 7 |
| | | Samples Collected or |
| /04 | Lithologic Description | Other Tests Performed |
| ٥٧ | | |
| | ROCKY FLATS ALLUVIUM | HNu Background=0.0 |
| • | 0.207.641601.5 | OVA Background=0.0 |
| | 0-2.0' SAMPLE. Recovered $1.2/2.0' = 60\%$. | Ludlum Background = 0.0. |
| | SANDY CLAY: dusky brown (5 YR 2/2); | No readings over |
| | some quartzite pebbles and cobbles; some | background. |
| | caliche throughout; damp. | |
| • | 20.40' SANGUE | |
| 5 | $\frac{2.0-4.0' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 100\%.}$ |] |
| | SANDY GRAVELS: moderate brown (5 | |
| | YR 3/4); some clay; some quartzite peb- | |
| | bles; trace caliche; very unconsolidated; | 1 |
| | subangular to subrounded. | |
| | 4.0-8.0' SAMPLE. | |
| | \int Recovered 0.8/4.0' = 20%. | |
| • - | SANDY GRAVELS: moderate brown (5 | |
| 10. | YR 4/4); some clay; some quartzite peb- bles and cobbles; trace caliche; damp. | |
| | oles and cobbles, trace canche, damp. | |
| • | 8.0-10.0' SAMPLE. | |
| • | Recovered 2.3/2.0' = 115%. | |
| | SAND: moderate reddish brown (10 R | |
| • | 4/6); some caliche; some clay; trace iron staining, moderate reddish orange (10 R | |
| | 6/6); damp. | |
| 15 | | |
| -v . | 10.0-13.0' SAMPLE. | |
| • | Recovered $0.4/3.0' = 130\%$. | |
| | SAND: moderate reddish brown (10 R 4/6); some clay; some caliche; trace mod- | |
| - | erate reddish orange (10 R 6/6) iron | |
| _ | stains; damp. | |
| | | |
| - | <u>₩</u> | |
| 20 | | |

| | Rockv Flat | s Plant; 903 Pad Area | • | 10 07pp |
|------------|--------------------|---|-----------------|-----------------------|
| | | | | I No. <u>10-87RRA</u> |
| Coordina | | | Ground Surfac | |
| Total Dep | 53.00' | | Water Level | Encountered 28.30' |
| | _ | | | Static N/A |
| | ompany Boy | | Driller D. J. | |
| | 10d <u>June 12</u> | | Helper K. P. | arker |
| Drilling M | ethod <u>Holl</u> | ow Stem Auger | Drilling Fluid | None |
| Logged B | C. J. W | bod | Checked By _ | Altaxola |
| | | ologist | | Site Manager |
| | | | | CEARP Manager |
| Common | Borehole | backfilled with Portland | d Type [cement | CEART WEILEST. |
| Communi | | | | |
| | | | | |
| . / | « / v / | • | | |
| /. | | Lithologic Desc | | Samples Collected or |
| / 0 | | Lithologie Dese | ription | Other Tests Performe |
| 20/ | | | | |
| | | 13.0-16.0' SAMPLE. | | |
| | | Recovered $1.2/3.0' = 40\%$. | | |
| | | SANDY CLAY: light olive | | |
| | | with moderate reddish or | | |
| | | iron stains; some quartzite | coobles; damp. | |
| | | ARAPAHOE FORM | MATION | |
| | | † | | |
| 25 | 国国 | 16.0-18.3' SAMPLE. | | |
| - | | Recovered 2.8/2.3' = 121%. CLAYSTONE: dark yellov | | |
| | | YR 6/6); iron staining | | |
| | [] | moderate reddish orange (| | |
| | | 7 | | |
| | | 18.3-20.8' SAMPLE. | | |
| | | Recovered $3.0/2.5' = 120\%$. | | |
| | | CLAYSTONE: olive gray | | j |
| 20 | | moderate reddish orange | | |
| <u>30</u> | | streaks; sandy; slightly dar | np. | |
| | | 20.8-23.3' SAMPLE. | | |
| | | Recovered $2.0/2.5^{\circ} = 80\%$. | | |
| | | CLAYSTONE: dark yellov | | |
| | [] | YR 6/6); weathered; | | |
| | | moderate reddish orange (| 10 R 6/6). | · |
| | | 23.3-28.3' SAMPLE. | | |
| | | Recovered $2.0/5.0' = 40\%$. | (NT ((0)) | |
| <u>35</u> | | CLAYSTONE: medium slightly sandy; weather | | ! |
| | | reddish orange (10 R 6 | • | |
| | | damp. | , -, stains, | |
| | | 28.3-30.3' SAMPLE. | | |
| | | Recovered $0.9/2.0^{\circ} = 45\%$. | | |
| | | CLAYSTONE: medium g | ray (N 6/0) to | |
| | | olive gray (5 Y 3/2) | with moderate | |
| | | reddish orange (10 R 6/ | | |
| 40 | | streaks; wet. | | |

| Coordinate Total Dept Drilling Coo Date Drille Drilling Me Logged By | h 53.00' Water Level | Static N/A arvie arker None Site Manager |
|--|---|--|
| 40 | Lithologic Description | Samples Collected or Other Tests Performe |
| 45 - | TOTAL DEPTH WITH PLOPPER: 31.0'; READJUST DEPTH. 31.0-36.0' SAMPLE. Recovered 4.0/5.0' = 80%. CLAYSTONE: light brown (5 Y 5/6) to very light gray (N 8/0); weathered; iron staining moderate reddish orange (10 R 6/6); wet. 36.0-40.0' SAMPLE. Recovered 1.7/4.0' = 42%. CLAYSTONE: moderate brown (5 YR 4/4); some iron staining moderate reddish orange (10 R 6/6); wet. 40.0-44.0' SAMPLE. Recovered 5.0/4.0' = 125%. CLAYSTONE: same as above | |
| <u>55</u> | CLAYSTONE: same as above. 44.0-48.0' SAMPLE. Recovered 2.0/4.0' = 50%. CLAYSTONE: light brown (5 YR 5/6); wea- thered; with iron staining streak, moderate reddish orange (10 R 6/6); wet. 48.0-50.4' SAMPLE. Recovered 2.0/2.4' = 83%. CLAYSTONE: dark gray (N 3/0); moist. | |
| | 50.6-53.0' SAMPLE. CLAYSTONE: dark gray (N 3/0); small lignite layer (coal) about 1/8" thick; moist to wet. TOTAL DEPTH: 53.00' | |

INDEX OF DATA

| Boring | No.: 11-87BR | |
|----------|----------------------------------|--|
| Comple | eted as well? Yes | |
| Data in | n File | |
| X_ | Log of Borehole | |
| X_ | Well Construction Summaries | |
| | Well Development Summaries | |
| | Hydraulic Conductivity Test Data | |
| | and Results | |
| | Packer Test Data and Results | |
| <u> </u> | Water Level Data | |

| Coordina Total Dep Drilling C Date Drill Drilling M | Rocky Flats Plant; 903 Pad Area N 35419.39 E 22989.24 The July 29, 1987 The Hollow Stem Auger J.B. Bergman Geologist | Ground Surfac Water Level | igh None |
|---|---|--|---|
| | Lithologic Des | scription | Samples Collected or Other Tests Performed |
| <u>5</u> | O.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100 0.0-0.5': SANDY GR dark yellowish brown (dant quartzite pebbles; roots and grasses; uncon 0.5-2.0': CLAY: dark ye YR 4/2); abundant strongly with HCl; few (5 YR 4/4) stains; some moist. | 0%. AVEL TOPSOIL: 10 YR 4/2); abunangular; abundant solidated; moist. 11owish brown (10 caliche; reacts moderate brown | No HNu, OVA or Ludlum (Alpha) readings taken. |
| <u>10</u> | 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100 CLAY: grayish orang abundant caliche; abunish orange (10 YR 6/6) quartzite pebbles; ribbon 4.0-7.0' SAMPLE. Recovered 3.4/3.0' = 113 | e (10 YR 7/4); dant dark yellow-) mottles; common ns; moist to wet. | |
| <u>15</u> | 4.0-5.2': CLAY; moderat (10 YR 5/4); abundar strongly with HCl; of pebbles; some light olive mottles; friable; dry. ARAPAHOE FO | nt caliche; reacts common quartzite e brown (5 Y 5/6) RMATION noderate yellowish | |
| . <u>20.</u> | brown (10 YR 5/4); con (5 YR 5/6) mottles; fria dry. | | |

| Coordinates N 35419.39 E 22989.24 Ground Surfa | High |
|---|---|
| Logged By J.B. Bergman Checked By Geologist | Site Manager |
| declogiet | Site manager |
| Comments | CEARP Manager |
| 20 Lithologic Description | Samples Collected or Other Tests Performed |
| 7.0-10.0' SAMPLE. Recovered 3.0/3.0' = 100%. CLAYSTONE: same as above; brittle; dry. 10.0-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. 10.0-11.0': CLAYSTONE: same as above with light brown (5 YR 5/6) FeO nodules at 10.7-10.8'; friable; dry. 11.0-12.0': INTERBEDDED CLAYSTONE AND SANDSTONE: moderate brown (5 YR 4/4); alternating layers; claystone 0.2-0.4' thick; sandstone 0.2-0.4' thick; very fine-grained, well sorted, rounded, moist sandstone; Claystone is moderate yellowish brown (10 YR 5/4) with abundant | |
| light brown (5 YR 5/6) stains; dense; weathered; moist. 12.0-15.0' SAMPLE. Recovered 2.5/3.0' = 83%. CLAYSTONE: moderate brown (5 YR 4/4); abundant sand patches; abundant FeO stains and nodules; moderate brown (5 YR 4/4) and light brown (5 YR 5/6); | |
| last 2" are a very pale orange (10 YR 8/2) sandstone; very fine-grained; some clay; dry. 15.0-17.0' SAMPLE. Recovered 2.6/2.0' = 130%. 15.0-15.2': CLAYSTONE: same as above; dry. 15.2-17.0': SANDSTONE: pale red (5 R 6/2); very fine-grained; wet at top; well sorted; rounded; moderate yellowish brown (10 YR 5/4) clay; layers at 16.7 | |
| and 16.9'; moist. | Page _2 of _4 |

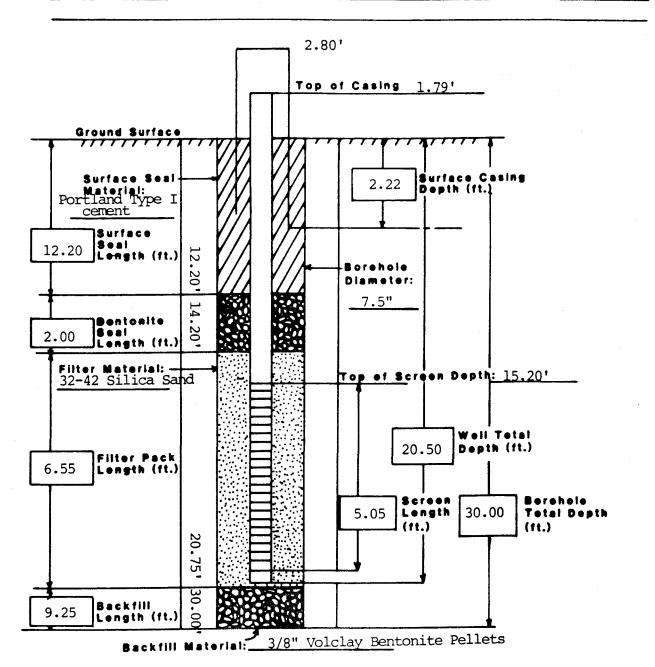
| Location Rocky Flats Plant; 903 Pad Ar | rea Borehote/Well-No. <u>11-87BR</u> |
|--|--|
| Coordinates N 35419.39 E 22989.24 | Ground Surface Elevation 5913.57' |
| Total Depth | Water Level Encountered 2.0' |
| | Static <u>5896.76' (12/01/87)</u> |
| Drilling Company Boyles Bros | Driller T. Merritt |
| Date Drilled July 29, 1987 | Helper T. High |
| Drilling Method Hollow Stem Auger | Drilling Fluid None |
| Logged By J.B. Bergman | Checked By Ataso he |
| Geologist | Site Manager |
| | CEARP Manager |
| Comments | |
| | |
| [6 7 6 7] | Samples Collected or Other Tests Performed |
| brown (10 YR 4/2 dant patches of v sand; abundant; dan | = 100%. TONE: dark yellowish 2); consolidated; abun- ery fine-grained, silty rk yellowish orange (10 |
| gray (N 6/0); fin abundant clay 1 rounded sand; mois | TONE: medium light e to medium-grained; aminae; well sorted, t. |
| } I I | = 55%. ONE: moderate brown le; approximately 20% |
| 4/4); abundant lig stains; abundant pa Y 3/2) claystone; a green (5 GY 7/2) | |
| moist. 25.8-27.0': CLAYST 3/2); trace dark yel | ONE: same as above; ONE: olive gray (5 Y llowish orange (10 YR e organic fragments; |

| Coordinates N 35419.39 E 22989.24 Total Depth 30.00' Drilling Company Boyles Bros Date Drilled July 29, 1987 Drilling Method Hollow Stem Auger Logged By J.B. Bergman Geologist | - · |
|---|--|
| | Samples Collected or Other Tests Performed |
| 27.0-30.0' SAMP Recovered 3.4/3 | .0' = 113%. ame as above; dry. |
| | |
| | |
| † † † | |

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 903 Pad Area 11-87BR Well No. Coordinates N 35419.39 E 22989.24 5913.57' Elevation: Ground Surface Total Depth: Well 20.50' Top of Casing _____5915.36' Borehole 30.00' Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter stainless steel Screen Material 0.010" wire wrap, type 316 TFJ Date installed July 29, 1987 Approved By installed By J.B. Bergman Geologist Hen Comments



12.11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 1187BR

12/01/87

18.60

5915.36

5896.76

INDEX OF DATA

| Boring | No.: 11-87A | | |
|---------|----------------------------------|--|--|
| Comple | Completed as well? No | | |
| Data in | File | | |
| | Log of Borehole | | |
| | Well Construction Summaries | | |
| | Well Development Summaries | | |
| | Hydraulic Conductivity Test Data | | |
| | and Results | | |
| | Packer Test Data and Results | | |
| | Water Level Data | | |

| Total Depth 7.70' Drilling Company Boy Date Drilled July 28, Drilling Method Hollo Logged By J. B. Ber Ge | les Bros 1987 W Stem Auger coman | Ground Surfa Water Level Driller T. 1 Helper T. 1 Orilling Fluid Checked By | None None Breat Alexas |
|--|---|---|---|
| | Lithologic E | Description | Samples Collected or Other Tests Performed |
| 10 | COLLU O.0-3.0' SAMPLE. Recovered 1.93/3.0' = 0.0-0.2': CLAY: med 4/0); dense homogeno 0.2-1.3': SAND AND brown (5 YR 3/4); q gravels; unsorted; urlar; very fine-grain abundant roots and gravels abundant roots and gravels. ARAPAHOE I 1.3-1.93': CLAYSTON 4/1); abundant call with HCl; consolidate homogenous; dry. 3.0-5.0' SAMPLE. Recovered 2.0/2.0' = 1 CLAYSTONE: olive gravels abundant dark yellow | 64%. lium dark gray (Nus; dry. GRAVEL: moderate and granite and granite acconsolidated; angulated sand; cobbles rasses; dry. FORMATION (E: olive gray (5 Yiche-reacts strongly ted; abrupt contact; abrupt contact; wish orange (10 YR ains; homogenous; 100%. s above; dry. | No readings over background. |

INDEX OF DATA

| Boring | No.: 12-87BR |
|----------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> </u> | Log of Borehole |
| <u> </u> | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| X_ | Water Level Data |

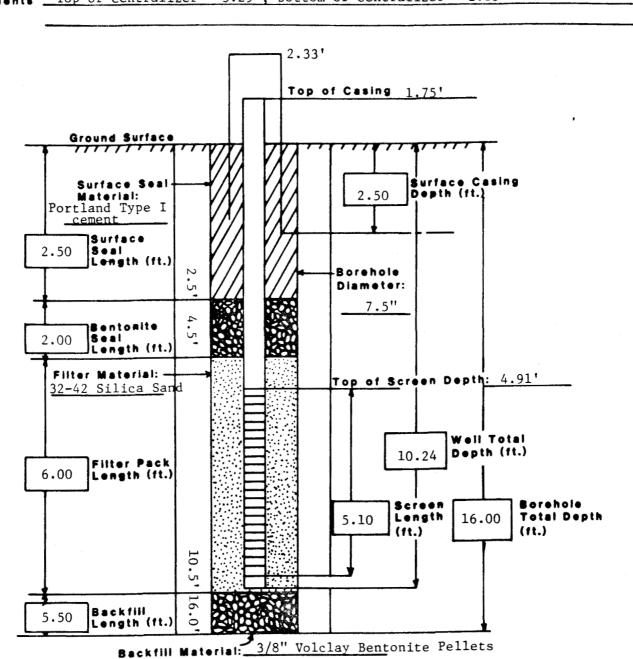
| Coordinates N 35590.92 E 22956.17 Total Depth 16.00' Drilling Company Boyles Bros Date Drilled July 14, 1987 Drilling Method Hollow Stem Auger Logged By S. Rogal Geologist | Borehole/Well No. 12-87BR Ground Surface Elevation 5934.74' Water Level Encountered 8.0' Static 5927.54' (12/01/8 Driller D. Jarvie J. Duncan Drilling Fluid None Checked By State Manager SEARP Manager |
|--|--|
| Comments Lithologic Des | Samples Collected or Other Tests Performed |
| COLLUVI | <u>UM</u> |
| 5 0.0-2.0' SAMPLE. Recovered 0.8/2.0' = 40% SILTY CLAY: dusky br trace sand; minor iron str 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 1000 2.0-3.5': CLAY: dusky br trace fine gravel; dry. 3.5-4.0': SANDY CLAY: 6/2); minor iron stains; d | own (5 YR 2/2); ains; grass; dry. OVA Background=3.5 No Ludlum readings. No readings over background. bown (5 YR 2/2); pale olive (10 Y |
| ARAPAHOE FOR 4.0-6.0' SAMPLE. Recovered 1.85/2.0' = 939 SANDSTONE: pale olive grained; well sorted; m minor dark staining; dry. | %. (10 Y 6/2); fine inor FeO stains; |
| 6.0-8.0' SAMPLE. Recovered 1.9/2.0' = 95% SANDSTONE: same as as staining. 8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 1009 SANDSTONE: same as as | above; more iron 6. |

| Location Rocky Flats Plant; 903 Pad Area | Borehole/Well No. 12-87BR |
|---|--|
| Coordinates <u>35590.92</u> E 22956.17 | Ground Surface Elevation 5934.74' |
| Total Depth 16.00' | Water Level Encountered 8.0' |
| | Static _5927.54' (12/01/8) |
| Drilling Company Boyles Bros | Driller D. Jarvie |
| Date DrilledJuly 14, 1987 | Helper J. Duncan |
| Drilling Method Hollow Stem Auger | Drilling Fluid None |
| Logged By S. Rogal | Checked By A Pascula |
| Geologist | Site Manager |
| | CEARP Manager |
| Comments | |
| | |
| Lithologic D | Samples Collected or Other Tests Performed |
| | |
| 10.0-12.0' SAMPLE. | |
| T Recovered $1.9/2.0' = 9$ | |
| ↓ ↓ SANDY SILTSTONE: | |
| Y 5/2); iron nodule a | at 11.5'; iron concre- |
| tions; dry. | |
| 12.0-14.0' SAMPLE. | |
| Recovered $1.9/2.0' = 9$ | 95%. |
| - + + SILTSTONE: light o | |
| iron concretions; | fractured; limonite |
| t stains; dry. | |
| + + 14.0-16.0' SAMPLE. | |
| Recovered $1.9/2.0' = 9$ | |
| † † CLAYSTONE: olive | |
| laminations; vertical stains; limonite stains | tractures with iron |
| stains, ilmonite stains, | , ury. |
| — † † TOTAL DEPTH: 16.0 | 00' |
| 1 1 1 | |
| | |
| † † † | |
| 1 1 | |
| | |
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Page _2

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 903 Pad Area 12-87BR Well No. Coordinates N 35590.92 E 22956.17 Elevation: Ground Surface _5934.74' Total Depth: Well 10.25' Top of Casing _____ 5936.49' Borehole 16.00' Formation of Completion __Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter __ type 316 TFJ stainless steel Screen Material 0.010" wire wrap. Surface Casing Diameter Date installed July 15, 1987 Approved By installed By S. Rogal Ben > Geologist Comments Top of centralizer = 3.29'; bottom of centralizer = 2.10'



12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft)

Water Level Elev. (ft)

** Well Number: 1287BR

12/01/87

8.95

5936.49

5927.54

INDEX OF DATA

| Boring | No.: 12-87BRA |
|---------|----------------------------------|
| Comple | eted as well? No |
| Data ir | ı File |
| X_ | Log of Borehole |
| | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| | Water Level Data |

| Location Rocky Flats Plant; 903 Pad Area Borehole/We | II No12-87BRA |
|---|---------------------------|
| | ce Elevation 5933.85' |
| Total Depth 6.06' Water Level | Encountered None |
| | Static N/A |
| Drilling Company Boyles Bros Driller N. | Wheeler |
| Date Drilled August 8, 10, 1987 Helper J. | Duncan |
| Drilling Method Hollow Stem Auger Drilling Fluid | None , |
| Logged By B.Q. Hyde Checked By | XX Papella |
| Geologist | SiteManager |
| | EARP Manager |
| Comments Borehole backfilled with Portland Type I cement | |
| | |
| | |
| Lithologic Description | Samples Collected or |
| Lithologic Description | Other Tests Performed |
| 0/ 1/6 / 6 / | |
| TOPSOIL | HNu Background=0.6. |
| | No HNu or Ludlum |
| 0.0-2.0' SAMPLE. | readings over background. |
| Recovered 0.33/2.0' = 16%. TOPSOIL: moderate brown (5 YR 4/4); | background. |
| organic rich; pebble to silt size; sub- | |
| rounded clasts; poorly sorted; pebbles as- | |
| sociated with sedimentary rocks; quartz | |
| 5 grains. | |
| COLLUVIUM | |
| COLLOVICA | |
| 2.0-4.0' SAMPLE. No recovery. | |
| 4.0-6.0' SAMPLE. | |
| $\frac{4.0-0.0 \text{ SAMPLE}}{\text{Recovered } 0.33/2.0'} = 16\%.$ | |
| SAND AND GRAVEL: pale olive (10 Y | |
| 6/2) to olive gray (5 Y 3/2); poorly sort- | |
| † † ed; matrix approximately 30% medium- | |
| grained sand and 50% clay; scattered pebble size clasts; unsupported in matrix; | 1 |
| predominantly quartitie clasts; clasts and | |
| grains subangular; sand grains predom- | |
| inantly quartz with some micas; | |
| t unconsolidated; dry. | |
| TOTAL DEPTH: 6.00' | |
| | |
| _ | |
| + + + | |
| \perp \perp \perp | |
| TTT | |
| + + + | |
| | |
| † † † | |

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INDEX OF DATA

| Boring | No.: 13-87BRA |
|----------|----------------------------------|
| Comple | ted as well? No |
| Data in | File |
| <u> </u> | Log of Borehole |
| | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| | Water Level Data |

Borehole/Well No. 13-87BRA Location Rocky Flats Plant: 903 Pad Area Ground Surface Elevation 5855.02' Coordinates N 35429.20 E 23530.11 Total Depth 41.50' Water Level Encountered None Static N/A Driller T. Merritt Drilling Company Boyles Bros Date Drilled July 27, 1987 Helper T. High Drilling Method Hollow Stem Auger Drilling Fluid Logged By L.A .Gregory-Frost Checked By _ Geologist Manager Comments , 0 Samples Collected or Lithologic Description Other Tests Performed TOPSOIL HNu Background=0.2 OVA Background=0.0 0.0-2.0' SAMPLE. Ludlum Background Recovered 1.9/2.0' = 95%. = 0.00.0-0.7': TOPSOIL: grayish red (5 R 4/2); sandy soil; abundant roots and grasses; No readings over abundant quartzite pebbles; base 0.1', 0.2' background. long flat quartzite pebbles/cobbles; sub-_5_ angular to angular; dry. **COLLUVIUM** 0.7-1.9': CLAY: grayish red (5 R 4/2); trace very fine-grained sand; abundant quartzite pebbles; abundant caliche deposits; consolidated; dry. 2.0-4.0' SAMPLE. 10 Recovered 1.9/2.0' = 95%. CLAY: grayish red (5 R 4/2) to moderate yellowish brown (10 YR 5/4); abundant quartzite pebbles; subangular; abundant caliche deposits; occasional roots; consolidated; dry. 4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. <u>15</u> 4.0-4.3': Same as above (2.0-4.0'). 20

01_6

Page -

| Coordinate Total Dep Drilling Co Date Drill Drilling M | Rocky Flats Plant: 903 Pad Area N 35429.20 E 23530.11 th 41.50' Market Bros July 27, 1987 Hollow Stem Auger L.A .Gregory-Frost Geologist | Ground Surfac | igh None |
|--|--|--|---|
| Comments | Lithologic Des | cription | Samples Collected or Other Tests Performed |
| <u>25</u> | 4.3-5.7': CLAYSTONE: g 4/2) with abundant light 5/6) and moderate yello YR 5/4) layers and mo caliche deposits and lam iron oxide nodules; occas weathered. 5.7-6.0': SILTSTONE: light 5/6); very fine-grained; weathered; dry. | rayish red (5 R at brown (5 YR owish brown (10 attling; abundant ninae; occasional sional roots; dry; | |
| 30 | 6.0-8.5' SAMPLE. Recovered 2.5/2.5' = 100% CLAYSTONE: light brown and dark yellowish brown very fine-grained sand abundant caliche depoconsolidated; dry. | wn (5 YR 5/6) vn (10 YR 4/2); | |
| <u>35</u> | 8.5-11.5' SAMPLE. Recovered 1.2/3.0' = 40%. 8.5-10.3': SANDSTONE: y Y 7/2); slightly silty; v sandstone; well sorted; we 10.3-10.5': CLAYSTONE: 1 ish brown (10 YR 5/4); fine grained sandstone caliche deposits; weathere | ellowish gray (5 ery fine-grained ell rounded; dry. moderate yellow- occasional very layes; abundant | |
| 40 | | | |

Page _2 _ of _6

| Coordinated Total Depth Drilling Com Date Drilling Met | Rocky Flats Plant: 903 Pad Area N 35429.20 E 23530.11 41.50' Peny Boyles Bros July 27, 1987 Hod Hollow Stem Auger L.A .Gregory-Frost Geologist | Ground Surfac Water Level | None // |
|--|---|---|-----------------------|
| Comments | | | |
| 40 | 11.5-13.5' SAMPLE. Recovered 3.0/2.0' = 150 10.5-10.8': CLAYSTONE (10.3-10.5'). 10.8-13.3': SANDSTONE (5 Y 6/1) and dark yel YR 6/6); very fine-gra rounded; slightly silty a along vertical fractures; 13.3-13.5': SANDSTONE (5 Y 6/1); very fine-gr cemented; calcareous; dr 13.5-16.5' SAMPLE. Recovered 3.0/3.0' = 100 13.5-13.8': SANDSTONE (13.3-13.5'). 13.8-16.3': CLAYSTONE ish brown (10 YR 5/4) Y 3/2) and dark yellowid 6/6) mottling; very sat grained; well rounded; | 2: light olive gray lowish orange (10 ined; well sorted; nd clayey; caliche damp to moist. 2: light olive gray ained; moderately y. 2: Same as above to moderate yellowwith olive gray (5 ish orange (10 YR ndy; very fine-occasional caliche | Other Tests Performed |
| _ | along vertical fractures layers; weathered; dry to 16.3-16.5': SANDSTONE (5 Y 6/1); very fine-gr cemented; calcareous; dr 16.5-18.5' SAMPLE. Recovered 2.0/2.0' = 100 SANDSTONE: light oliv very fine to fine-graine moderately sorted; dry to | o damp. : light olive gray ained; moderately y. %. te gray (5 Y 6/1); ed; well rounded; | |

| | ky Flats Plant: 903 Pad Area N 35429.20 E 23530.11 | | I No. 13-87BRA • Elevation 5855.02' |
|----------------|---|--------------------|--|
| rotal Depth _ | | | Encountered None |
| rotal Depth _ | 71.00 | Water Editor | Static N/A |
| Drilling Compa | ny Boyles Bros | Driller T. M. | |
| • | July 27, 1987 | Helper T. H | |
| - | Hollow Stem Auger | Drilling Fluid | |
| | | - | |
| rodden By | J.A .Gregory-Frost Geologist | Checked By _ | Site Manager |
| | | • | CEARP Manager |
| Comments | | | |
| | Lithologic Des | scription | Samples Collected or Other Tests Performe |
| | | | |
| + | 18.5-21.5' SAMPLE. | | |
| | Recovered $3.0/3.0' = 100$ | %. | |
| + | † † 18.5-19.55': SANDSTON | E: moderate yel- | 1 |
| 1 | lowish brown (10 YI | | |
| T | T medium-grained; well | | |
| + | sorted; friable; slightly moist. | calcareous; dry to | |
| İ | $\frac{1}{19.55-20.5}$: SANDSTON | E: moderate vel- | 1 |
| | lowish brown (10 YR | | |
| 1 | olive gray (5 Y 6/1) an | d brownish black | |
| | (5 YR 2/1) layers and | | |
| + | grained sand; several i | | |
| | rounded oval shape; dry | • | |
| † | † † 20.5-21.5': SANDSTONE: | moderate vellow- | 1 |
| 1 | ish brown (10 YR 5/4); | | |
| | grained; well rounded; | well sorted; fri- | |
| - + | † able; slightly calcareous; | dry to moist. | |
| | 1 1 21 5 22 5 5 4 1 67 1 7 | | |
| T | $\frac{21.5-23.5' \text{ SAMPLE.}}{\text{Recovered } 2.5/2.0'} = 125$ | 04 | |
| + | 1 21.5-22.5': SANDSTONE: | | |
| | ish brown (10 YR 5/4 | • | 1 |
| † | grained; moderately sor | ted; well rounded | 1 |
| 1 | to rounded; clay lamina | | |
| ļ | stone nodules and ver | - | |
| - + | layers at base; fining up 22.5-23.5': SANDSTONE | | 1 |
| 1 | (5 Y 6/1); very fine-gra | | |
| | well rounded; friable; m | | |
| + | + + | | |
| | | | |
| + | † † | | |
| | 1 1 | | } ' |
| | 1 1 | | |

| | Coordinates N 35429.20 E 23530.11 Ground Surface Total Depth 41.50' Water Level | None |
|--|---|------|
| Recovered 3.4/3.0' = 113%. 23.5-23.9' SANDSTONE: moderate yellowish brown (10 YR 5/4); clayey very fine to coarse-grained; poorly sorted; rounded to well rounded; moist. 23.9-24.7': CLAYSTONE: moderate yellowish brown (10 YR 5/4); very finegrained; sandy; silty; weathered; moist. ARAPAHOE FORMATION 24.7-26.5': CLAYSTONE: olive gray (5 Y 4/1) with occasional dark yellowish orange (10 YR 6/6) mottling; very finegrained; sandy; slightly weathered; moist. 26.5-28.5' SAMPLE. Recovered 2.1/2.0' = 105%. 26.5-28.5': CLAYSTONE: Same as above (24.7-26.5'). 28.5-31.5' SAMPLE. Recovered 4.0/3.0' = 133%. CLAYSTONE: medium dark gray (N 4/0) and dark yellowish orange (10 YR 6/6); sandy; slightly weathered; moist. 31.5-33.5' SAMPLE. Recovered 1.9/2.0' = 95%. CLAYSTONE: medium dark gray (N 4/0) to dark greenish gray (5 GY 4/1) with dark yellowish orange (10 YR 6/6) mottling; silty; trace very fine-grained sand; | Lithologic Description | , |
| ⊥ ⊥ ⊥ slightly weathered moist | Recovered 3.4/3.0' = 113%. 23.5-23.9': SANDSTONE: moderate yellowish brown (10 YR 5/4); clayey very fine to coarse-grained; poorly sorted; rounded to well rounded; moist. 23.9-24.7': CLAYSTONE: moderate yellowish brown (10 YR 5/4); very finegrained; sandy; silty; weathered; moist. ARAPAHOE FORMATION 24.7-26.5': CLAYSTONE: olive gray (5 Y 4/1) with occasional dark yellowish orange (10 YR 6/6) mottling; very finegrained; sandy; slightly weathered; moist. 26.5-28.5' SAMPLE. Recovered 2.1/2.0' = 105%. 26.5-28.5': CLAYSTONE: Same as above (24.7-26.5'). 28.5-31.5' SAMPLE. Recovered 4.0/3.0' = 133%. CLAYSTONE: medium dark gray (N 4/0) and dark yellowish orange (10 YR 6/6); sandy; slightly weathered; moist. 31.5-33.5' SAMPLE. Recovered 1.9/2.0' = 95%. CLAYSTONE: medium dark gray (N 4/0) to dark greenish gray (5 GY 4/1) with dark yellowish orange (10 YR 6/6) mottling; silty; trace very fine-grained sand; | |

| Location Rocky Flats Plant: 903 Pad | Area Borehole/Well No. 13-87BRA |
|---|---|
| Coordinates N 35429.20 E 23530.11 | Ground Surface Elevation 5855.02' |
| Total Depth 41.50' | Water Level Encountered None |
| | Static N/A |
| Drilling Company Boyles Bros | Driller T. Merritt |
| Date Drilled July 27, 1987 | Helper T. High |
| Drilling Method Hollow Stem Auger | Drilling Fluid None |
| Logged By L.A .Gregory-Frost | Checked By A Pascha |
| Geologist | Site Manager |
| | CEARP Manager |
| Comments | |
| | |
| Litholog | Samples Collected or Other Tests Performed |
| | |
| + + + 33.5-36.5' SAMPL | E. |
| | |
| | STONE: dark greenish |
| | with dark yellowish or- /6) mottling and along |
| fractures; silty; sl | ightly weathered; moist. |
| | ONE: light olive gray (5 |
| - $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ | mogenous; moist. |
| $\frac{1}{1}$ $\frac{1}{36.5-38.5}$ SAMPL | F |
| Recovered 2.0/2.0 | |
| 1 1 1 | STONE: Same as above |
| (35.3-36.5'); become gradational lower | nes clayier toward base; |
| | STONE: light olive gray |
| | very fine-grained sand; |
| silty; slightly wea | thered; moist. |
| 38.5-41.5' SAMPL | |
| Recovered 1.5/3.0 | |
| | ht olive gray (5 Y 5/2) |
| | ish orange (10 YR 5/6) |
| silty; slightly wea | ong fractures; slightly |
| 1 1 1 | |
| T TOTAL DEPTH: | 41.50' |
| - + + + | |
| 1 1 | |
| | |
| † † † | |
| 1 1 1 | |
| ŢŢŢ | |
| + + + | |
| | |
| | Page <u>6</u> 01 <u>6</u> |

INDEX OF DATA

| Boring | No.: 14-87BR |
|-----------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> X</u> | Log of Borehole |
| <u>X</u> | Well Construction Summaries |
| | Well Development Summaries |
| <u> </u> | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| X | Water Level Data |

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 14-87BR Ground Surface Elevation _5855.0' Coordinates N 35236.67 E 23504.68 Total Depth 32.40' Water Level Encountered 12.5';19.0';22.5' Static 5842.16' (12/01/87) Driller T. Merritt Drilling Company Boyles Bros Helper T. High Date Drilled July 21, 1987 Drilling Method Hollow Stem Auger Drilling Fluid _ Logged By J. B. Bergman Checked By Geologist EARP Manager Comments = 10 A A Samples Collected or Lithologic Description Other Tests Performed **TOPSOIL** HNu Background=0.2 OVA Background=0.0 Ludlum Background 0.0-2.0' SAMPLE. Recovered 1.8/2.0' = 90%. = 0.00.0-0.7': TOP SOIL: grayish red (5 R 4/2); No readings over sandy soil; abundant roots and grasses; background. abundant quartzite pebbles; unconsolidated: drv. 5 COLLUVIUM 0.7-1.8': CLAY: grayish red (5 R 4/2); trace very fine-grained sand; common caliche deposits; homogenous; consolidated; slightly damp. 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. 10 CLAY: grayish red (10 R 4/2); abundant quartzite pebbles and gravels; subangular; consolidated, abundant caliche deposits; dry. 4.0-7.0' SAMPLE. Recovered 3.4/3.0' = 113%. 4.0-5.2': CLAY: same as above; dry. **ARAPAHOE FORMATION** 15 5.2-7.0': CLAYSTONE: grayish red (5 R 4/2); abundant caliche (laminae); strongly reacts with HCl; abundant light brown (5 YR 5/6); abundant FeO nodules at 6.0-6.2'; consolidated; dry to slightly moist.

of_

20

| Drilling Company Boyles Bros Date Drilled July 21, 1987 Drilling Method Hollow Stem Auger Logged By J. B. Bergman Geologist Static 5842.16' (12/01/ T. Merritt Drilling Fluid None Checked By Site Manager | |
|--|-------------|
| Comments | |
| 20 Lithologic Description Samples Collected of Other Tests Perform | or i • d |
| 7.0-9.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; trace very fine-grained sand; dry. 9.0-12.0' SAMPLE. Recovered 3.0/3.0' = 100%. SANDSTONE: light brownish gray (5 YR 6/1); clay laminae; abundant moderate yellowish brown (10 YR 5/4) mottles; ranges from very fine-grained to medium-grained; rounded; well sorted; weathered; moderately consolidated; friable; slightly moist. | |
| 12.2-12.5' SAMPLE. No recovery. 12.5-14.5' SAMPLE. Recovered 2.3/2.0' = 115%. CLAYSTONE: moderate yellowish brown (10 YR 5/4); abundant, very fine-grained, silty sand; abundant FeO nodules, light brown (5 YR 5/6); wet at 12.5-12.7'; dry from 12.7-14.5'. | |
| 14.5-17.5' SAMPLE. Recovered 3.0/3.0' = 100%. CLAYSTONE: same as above; 40% clay, 30% very fine-grained sand; 30% silt; abundant light brown (5 YR 5/6) mottles; abundant light brown (5 YR 5/6) FeO nodules; dry. | |

Page 2

| Coordinates N 35236.67 E 27 Total Depth 32.40' Drilling Company Boyles Bros Date Drilled July 21, 1987 Drilling Method Hollow Stem A Logged By J. B. Bergman Geologist Comments | Driller T. M. Helper T. H. | igh |
|--|--|---|
| | Lithologic Description | Samples Collected or Other Tests Performed |
| Recover 17.5-19.6 dry. 19.0-19.3 pink (5 grained nous; fr 19.5-22 Recover 19.5-21 grades YR 5/6 21.5-22 3/2); at mottles; | ed 2.0/2.0' = 100%. O': CLAYSTONE: same as above; S': SANDSTONE: grayish orange YR 7/2); abrupt contact; coarse well sorted; rounded; homoge- iable; wet. S': SAMPLE. red 3.0/3.0' = 100%. S': SANDSTONE: same as above; down gradient to light brown (5); abundant heavy minerals; wet. S': CLAYSTONE: olive gray (5 Y bundant light brown (5 YR 5/6) consolidated; dense; trace sand; hous; dry. | |
| Recover 22.5-23.8 pink (5 sorted; wet. 23.8-25.3 3/2); at mottles; | 5' SAMPLE. ded 3.6/3.0' = 120%. S: SANDSTONE: grayish orange S: YR 7/2); coarse-grained; well rounded; common heavy minerals; S': CLAYSTONE: olive gray (5 Y bundant light brown (5 YR 5/6) trace silty sand; dense; dry. Stal depth measured to 24.40'. tt depth. | |

Page _3 ___ of _4

| Coordinates N 3522 Total Depth 32.40 Drilling Company Botto Drilling Method Holloged By J. B. 1 | oyles Bros Plus Stem Auger Ground Surface Sur | None |
|--|--|---|
| | Lithologic Description | Samples Collected or Other Tests Performed |
| | 24.4-27.4' SAMPLE. No recovery. | |
| II | 27.4-29.4' SAMPLE. No recovery. | |
| II | 29.4-30.4' SAMPLE. No recovery. | |
| ŢŢ | 30.4-32.4' SAMPLE. No recovery. | |
| _ | TOTAL DEPTH: 32.40' | |
| ↓ ↓ | + | |
| + + | + | |
| + + | + | |
| + + | + . | |
| - + + | † | |
| † † | † | |
| † † | | |
| † † | 1 | |
| _ 1 1 | I | |
| _ 1 1 | 1 | |
| 1 1 | + | |
| 1 1 | 1 | |
| | + | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 903 Pad Area

Well No. ___14-87BR

Coordinates N 35236.67 E 23504.68

Elevation: Ground Surface _5855.00'

Total Depth: Well 24.30'

Installed By J.B. Bergman

Top of Casing __ 5856.73'

Borehole 32.40'

Formation of Completion Arapahoe Formation

Geologist

Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter

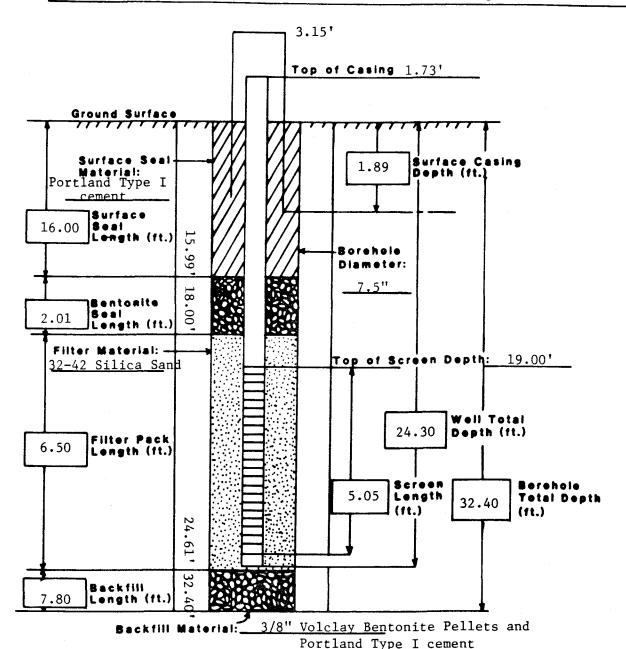
stainless steel Screen Material 0.010" wire wrap, type 316 TFJ

Date installed July 22-23.

Approved By

Site Manager CEARP Manager

Comments Used Portland Type I cement and 3/8" Volclay Bentonite Peffets as backfill due to problems encountered with slough during installation.



PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) HETHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER*)
- (2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-15-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 14-87 BR

INPUT DATA ARE:

INMER CASING DIAMETER = 2.00 INCHES LENGTH
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES DEPTH
DIAMETER OF DRILLED HOLE = 7.50 INCHES THICKN
ESTIMATED POROSITY OF GRAVEL PACK = .25 FALLIN
NUMBER OF HEAD-TIME DATA POINTS = 42

LENGTH OF SCREEN OR INTAKE PORTION = 6.50 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 11.55 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 11.30 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING,"0" IF RISING)

| TIME | | HEAD |
|------------------|---|--------------|
| Sec |) | (FEET) |
| 1.00 | | 1.260 |
| 2.00 | | 1.260 |
| 3.00 | | 1.260 |
| 4.00 | | 1.260 |
| 5.00 | | 1.250 |
| 6.00 | | 1.250 |
| 16.00 | | 1.230 |
| 36.00 | | 1.210 |
| 66.00 | | 1.180 |
| 96.00 | | 1.150 |
| 126.00 | | 1.130 |
| 156.00 | | 1.110 |
| 186.00 216.00 | | 1.080 |
| 246.00 | | 1.040 |
| 276.00 | | 1.020 |
| 306.00 | | .990 |
| 336.00 | | .970 |
| 366.00 | | .950 |
| 396.00 | | . 740 |
| 426.00 | | .910 |
| 456.00 | | .900 |
| 501.00 | | .870 |
| 551.00 | | .840 |
| 621.00 | | .810 |
| 681.00 | | .770 |
| 741.00 801.00 | | .740 |
| 861.00 | | .720 .700 |
| 921.00 | | .670 |
| 781.00 | | .640 |
| 1101.00 | | .600 |
| 1221.00 | | .560 |
| 1341.00 | | .530 |
| 1611.00 | | .460 |
| 1851.00 | | .410 |
| 2091.00 | | .370 |
| 2331.00 | | . 330 |
| 2631.00 | | .300 |
| 2931.00 | | .270 |
| 3231.00 | | . 260 |
| 3531.00 | | .240 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> 1.1615 1.1739

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 7.41E-07 FT/sec = 2.26E-05 CM/sec

TRANSMISSIVITY = 8.38E-06 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.06E-06 FT/sec = 3.23E-05 CM/sec

TRANSMISSIVITY = 1.20E-05 FT##2/sec

12/11/87

Water Level Data

for

Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC TOC (ft)

Water Level Elev. (ft)

** Well Number: 1487BR

12/01/87

14.57

5856.73

5842.16

INDEX OF DATA

| Boring | No.: 15-87/BH30-87 |
|----------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| X_ | Log of Borehole |
| X | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| <u> </u> | Water Level Data |

| Location Rocky Flats Plant: 903 P | ad Area Borehole/Well No. 15-87/BH30-87 |
|-----------------------------------|--|
| Coordinates N 36020.14 E 23139. | |
| Total Depth 27.001 | Water Level Encountered 20.00' |
| | Static 5952.44' (12/01/8' |
| Drilling Company Boyles Bros | Driller R. Sharp |
| Date Drilled June 16, 1987 | Helper T. Merritt |
| Drilling Method Hollow Stem Auger | Drilling Fluid None |
| Logged By K.D. Holliway | Checked By Atasche |
| Geologist | Site Manager |
| | CEARP Manager |
| Comments Sample BH308720WT dou | bles as sample BH308722CT due to insufficient |
| recovery for two samp | les. |
| | |
| | Samples Collected or |
| Little | ologic Description Other Tests Performed |
| O Little | |
| / A 場では2 | Y FLATS ALLUVIUM HNu Background=0.2 |
| LOC L | Y FLATS ALLUVIUM HNu Background=0.2 OVA Background=0.0 |
| 0.0-2.0' SAM | · · · · · · · · · · · · · · · · · · · |
| Recovered 1 | 1/2.0' = 55%. |
| | AVEL: dark yellowish brown |
| | ; quartzite pebbles and cob- ay; fine-grained sand (2.0-3.5 sample: BH30870010. |
| | sorted; roots and grasses; dry. |
| 5 709 | 5.0': Field screen |
| 2.0-3.4' SAM | |
| | 4/1.4' = 100%. 15.0; OVA = 0.1. |
| | AVEL: moderate orange pink quartzite cobbles and pebbles; |
| | ine-grained sand (2.0-1.0 phi); |
| dry. | |
| 2440 | recovery Drilled with center 9.0-10.35': Waste |
| 3.4-4.0'. No bit. | recovery. Drilled with center sample: BH308710WS. |
| 10 | |
| 4.0-7.0' SAM | |
| | $\frac{2}{3.0}$ ' = 40%. readings: HNu = 5.0- |
| | AVEL: light brown (5 YR 15.0; OVA = 0.1. te cobbles and pebbles; trace |
| | ained sand (2.5-1.5 phi); some $\frac{11.5-17.15}{11.5-17.15}$: |
| caliche; ver | y pale orange (10 YR 8/2); Composite sample: |
| damp to dry | BH30871020. |
| 7.0-8.5' SAM | PLE. 15.0': Field screen |
| | 15/1.5' = 77%. readings: HNu = |
| | AVEL: light brown (5 YR 10.0 ; OVA = 0.1 . |
| | te cobbles and pebbles; trace ained sand (2.5-1.5 phi); dry. 20.0': Field screen |
| to the clay, time-gr | readings: $HNu = 2.0$; |
| 8.5-9.0', No | recovery. Drilled with center OVA = 0.2. |
| bit. | |
| 12:01 J | |
| 20 | |

Location Rocky Flats Plant: 903 Pad Area Borehole/Well No. 15-87/BH30-87 Coordinates N 36020.14 E 23139.88 Ground Surface Elevation 5970.891 Water Level Encountered 20.00' Static 5952.44' (12/01/87) Drilling Company Boyles Bros Driller R. Sharp Date Drilled June 16, 1987 Helper T. Merritt Drilling Method Hollow Stem Auger Drilling Fluid None Logged By K.D. Holliway Checked By _ Geologist CEARP Manager Comments Sample BH308720WT doubles as sample BH308722CT due to insufficient recovery for two samples. .0 Samples Collected or Lithologic Description 9.0-11.5' SAMPLE. 20.0-20.8': Water کوں کوں Recovered 1.35/2.5' = 54%. table sample: SANDY GRAVEL: same as above; dry. BH308720WT. 11.5-14.0' SAMPLE. Recovered 1.2/2.5' = 48%. SANDY GRAVEL: same as above; damp. 24.5-25.2': Bedrock 14.0-16.0' SAMPLE. <u>25</u> sample: BH308725BR. Recovered 0.7/2.0' = 35%. SANDY GRAVEL: same as above: damp. 16.0-20.0' SAMPLE. Recovered 1.15/4.0' = 29%. SANDY GRAVEL: light brown (5 YR 5/6) to grayish orange (10 YR 7/4) in sand zone 16.80-17.10'; coarse to finegrained sand (0.5-3.0 phi); well sorted; _30 damp to moist. 20.0-22.0' SAMPLE. Recovered 2.5/2.0' = 125%. GRAVEL: light brown (5 YR 5/6); some sand; quartzite cobbles and pebbles; wet. **ARAPAHOE FORMATION** 22.0-24.5' SAMPLE. Recovered 2.2/2.5' = 88%. CLAYSTONE: light olive gray (5 Y 5/2); moderate reddish orange (10 R 6/6); iron stained patches; damp to moist. 24.5-27.0' SAMPLE. Recovered 2.65/2.5' = 106%. CLAYSTONE: same as above; damp to moist. TOTAL DEPTH: 27.00'

of _

Page.

WELL COMPLETION INFORMATION

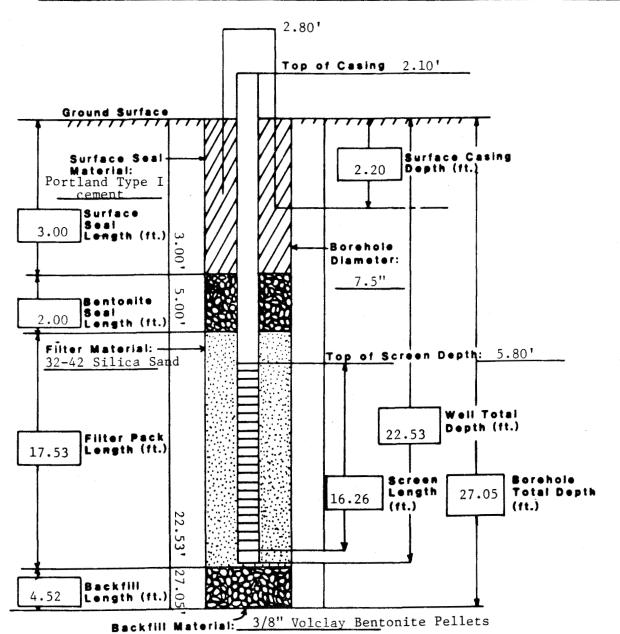
Well No. 15-87/BH30-87 Location Rocky Flats Plant; 903 Pad Area Coordinates _N 36020.14 E 23139.88 Elevation: Ground Surface 5970.89' Total Depth: Well __22.53' 5972.99' Top of Casing ____ Borehole 27.05' Formation of Completion ___ Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter stainless steel Approved By ___

Date installed June 17, 1987 Installed By K.D. Holliway Geologist

Site Manager est Den

Manager

Water encountered in a sandy gravel at 20.0'. Water level in well Comments _ $6/17/87 = 22.9^{\circ}$.



Water Level Data for Rockwell (Rocky Flats)

| Date | Depth to Water | Elevation | Water Level |
|---------------|----------------|--|-------------|
| Measured | from TOC | TOC (ft) | Elev. (ft) |
| ** Well Numbe | r: 1587 | and the second s | |
| 09/29/87 | 20.80 | 5972.99 | 5952.19 |
| 12/01/87 | 20.55 | 5972.99 | 5952.44 |

INDEX OF DATA

| Boring No.: 16-87BR | | | | |
|---------------------|----------------------------------|--|--|--|
| Comple | Completed as well? Yes | | | |
| Data in File | | | | |
| <u> </u> | Log of Borehole | | | |
| X | Well Construction Summaries | | | |
| | Well Development Summaries | | | |
| X | Hydraulic Conductivity Test Data | | | |
| | and Results | | | |
| X | Packer Test Data and Results | | | |
| <u> </u> | Water Level Data | | | |

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.06' Total Depth __174.00' Water Level Encountered 20.0' Static _5885.51' (12/01/87) Driller N. Wheeler; P. Bushkovski Drilling Company Boyles Bros Date Drilled June 17-18, 1987; July 6-8, 1987 Helper D. Jarvie; K. Parker Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid Logged By C.J. Wood; J.B. Bergman Checked By Geologist Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. • Samples Collected or Lithologic Description Other Tests Performed 00 HNu Background=0.0 **ROCKY FLATS ALLUVIUM** OVA Background=0.0 0.0-2.0' SAMPLE. No readings over Recovered 2.0/2.0' = 100%. background. SANDY GRAVELS: pale vellowish brown (10 YR 6/2); quartzite pebbles and cobbles; subrounded to subangular; some HNu Background= rock in upper 0.5'; dry. 0.2 - 0.8.No OVA readings. No readings over 2.0-4.0' SAMPLE. Recovered 1.64/2.0' = 82%. background. SAND AND GRAVEL: moderate brown (5 YR 4/4); some sandy clay; quartzite pebbles and cobbles; subrounded to subangular; dry. 4.0-6.0' SAMPLE. Recovered 0.95/2.0' = 47%. 10 SANDY GRAVEL: moderate brown (5 YR 4/4); grades into caliche; dry. 6.0-7.0' SAMPLE. Recovered 1.45/1.0' = 145%. SAND AND CLAY: yellowish gray (5 Y 7/2) to moderate brown (5 Y 4/4); some quartzite cobbles; coarse sand; some caliche; damp. 15 7.0-9.0' SAMPLE. Recovered 0.9/2.0' = 45%. SANDY GRAVEL: light brown (5 YR 6/4); quartzite pebbles and cobbles; subrounded to subangular; dry.

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Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.06' Total Depth _174.00' Water Level Encountered 20.0' Static 5885.51' (12/01/87) Driller N. Wheeler; P. Bushkovski Drilling Company Boyles Bros Date Drilled June 17-18, 1987; July 6-8, 1987 Helper D. Jarvie; K. Parker Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid None Logged By C.J. Wood; J.B. Bergman Checked By _ Site Manager Geologist CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. Samples Collected or Lithologic Description Other Tests Performed 9.0-11.0' SAMPLE. Recovered 1.75/2.0' = 87%. SANDY GRAVEL TO SANDY CLAY: gravels moderate brown (5 YR 4/4); sand light brown (5 YR 5/6) to dark greenish gray (5 GY 4/1); iron staining streaks moderate reddish orange (10 R 6/6); trace of caliche; weathered; dry. 25 11.0-13.0' SAMPLE. Recovered 2.0/2.0' = 100%. SAND: moderate reddish orange (10 R 6/6); some quartzite pebbles; trace caliche: coarse sand; weathered; damp. 13.0-15.0' SAMPLE. Recovered 2.0/2.0' = 100%. vellowish SANDY GRAVELS: dark 30 orange (10 YR 6/6) to grayish green (10 GY 5/2); quartzite pebbles and cobbles; damp to dry. 15.0-17.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDY GRAVELS: moderate reddish orange (10 R 6/6); highly weathered; numerous quartzite pebbles; trace caliche; <u>35</u> damp. 17.0-19.0' SAMPLE. Recovered 1.7/2.0' = 85%. SAND: moderate reddish orange (10 R 6/6); weathered; numerous quartzite pebbles; damp. 40

Page.

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. __16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.06' Total Depth __174.00' Water Level Encountered 20.0' Static <u>5885.51' (12/01/87)</u> Drilling Company Boyles Bros Driller N. Wheeler; P. Bushkovski Date Drilled June 17-18, 1987; July 6-8, 1987 Helper D. Jarvie; K. Parker Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid None Logged By C.J. Wood; J.B. Bergman Checked By Geologist Site Manager CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. , 0 Samples Collected or Lithologic Description Other Tests Performed 19.0-21.0' SAMPLE. Recovered 1.7/2.0' = 85%. SANDY GRAVEL: moderate brown (5 YR 4/4); quartite pebbles and cobbles: wet. 21.0-23.0' SAMPLE. Recovered 1.6/2.0' = 80%. 21.0-21.9': SANDY GRAVEL: same as 45 above; wet. **ARAPAHOE FORMATION** 21.9-22.6': CLAY: olive gray (5 Y 3/2); dry. 48.41-58.06': Packer Test Interval #23. 23.0-24.0' SAMPLE, aborted test. Recovered 0.9/1.0' = 90%. -50 CLAY: medium light gray (N 6/0); iron staining moderate reddish orange (10 R 6/6); wet. 24.0-26.0' SAMPLE, Recovered 2.0/2.0' = 100%. CLAY: medium light gray (N 6/0) to olive gray (5 Y 3/2); moderate reddish orange (10 R 6/6); iron staining to dark 55.90-65.55": Packer reddish brown (10 R 4/6); highly wea-<u>55</u> Test Interval #22. thered; damp to wet. 26.0-28.0' SAMPLE. 57.90-67.55': Packer Recovered 2.0/2.0' = 100%. Test Interval #21, CLAY: olive gray (5 Y 3/2); iron staining failed on 2/3 moderate reddish orange (10 R 6/6); pressure test. slightly weathered; damp. 60

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Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 16-87BR Coordinates _N 36139.59 E 23140.49 Ground Surface Elevation 5969.06' Total Depth __174.00' Water Level Encountered 20.0' Static 5885.51' (12/01/87) Drilling Company Boyles Bros Driller N. Wheeler; P. Bushkovski Date Drilled June 17-18, 1987; July 6-8, 1987 Helper D. Jarvie; K. Parker Drilling Method Hollow Stem Auger; Rotary Core None Drilling Fluid C.J. Wood; J.B. Bergman Checked By 1 Geologist CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. Samples Collected or ٠ Lithologic Description 28.0-29.0' SAMPLE, Recovered 1.4/1.0' = 140%. CLAY: olive gray (5 Y 3/2); iron staining moderate reddish orange (10 R 6/6); weathered; damp. 29.0-30.0' SAMPLE. Recovered 1.35/1.0' = 135%. CLAY: moderate olive brown (5 Y 4/4) to 65 olive gray (5 Y 3/2); some iron staining moderate reddish orange (10 R 6/6); damp. 30.0-32.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: moderate reddish orange (10 R 67.55-77.20': Packer 6/6) to dark reddish brown (10 R 3/4); Test Interval #20. upper foot olive gray (5 Y 3/2), moderate 70 reddish orange (10 R 6/6) with iron stain-69.55-79.20': Packer ing throughout; some dusky yellow areas Test Interval #19, (5 Y 6/4); highly weathered; wet. aborted test. 32.0-34.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: olive gray (5 Y 3/2); iron staining moderate reddish orange (10 R 6/6); weathered; wet. 75 34.0-36.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: same as above; wet. 36.0-38.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: same as above; wet. 79.05-88.70': Packer

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Test Interval #18.

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_ of _13

| | ocky Flats Plant; 903 Pad Area | | No. 16-87BR |
|---|---|---------------------------------|--|
| | N 36139.59 E 23140.49 | | • Elevation 5969.06' |
| Total Depth | 174.00 | Water Level | Encountered 20.0' Static 5885.51' (12/01/8' |
| | | ., | |
| | Boyles Bros | | neeler; P. Bushkovski |
| | June 17-18, 1987; July 6-8, 198 | | |
| | Mollow Stem Auger; Rotary Cor | | |
| ogged By _ | C.J. Wood; J.B. Bergman Geologist | Checked By _ | Site Manager |
| Comments _ | Surface casing set to 49.17' by Cr | aig Wood on Jur | CEARP Manager ne 18, 1987. |
| - S. O. | Lithologic Desc | ription | Samples Collected or Other Tests Performed |
| 804 | | | |
| | 38.0-40.0' SAMPLE. Recovered 2.0/2.0' = 100% CLAY: light olive gray (ate reddish orange (10 R ing; weathered; wet. 40.0-42.0' SAMPLE. | 5 Y 5/2); moder- | |
| 85 EB | Recovered 2.0/2.0' = 100% CLAY: light olive gray some olive gray (5 Y 3/moderate reddish orange staining; weathered; wet. | (5 Y 5/2) with 2) streaks; some | |
| | 42.0-44.0' SAMPLE. Recovered 2.1/2.0' = 105% CLAY: same as above; we | | 88.70-98.35': Packer Test Interval #17. |
| 90 E | 44.0': Unweathered/west contact. | thered bedrock | 90.70-100.35': Packer Test Interval #16, aborted test. |
| | 44.0-46.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: brownish b unweathered. | | |
| 95 E | 46.0-48.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as ab | | |
| | 48.0-50.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as ab | | |
| 100 | | | Page 5 01 13 |

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. __16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.Q6' Total Depth _ 174.00' Water Level Encountered 20.0' Static 5885.51' (12/01/87) Driller N. Wheeler; P. Bushkovski Drilling Company Boyles Bros Helper D. Jarvie; K. Parker Date Drilled <u>June 17-18, 1987; July</u> 6-8, 1987 Drilling Method Hollow Stem Auger; Rotary Core Drilling Field None Logged By C.J. Wood; J.B. Bergman Checked By _ S Geologist Site Manager CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. Samples Collected or Lithologic Description Other Tests Performed 100.50-110.15': Packer 48.0-51.5' SAMPLE. Recovered 2.2/3.5' = 63%. Test Interval #15. RQD = 1.4/2.2' = 64%.48.0-49.4': CEMENT. 49.4-50.2': CLAYSTONE: olive gray (5 Y 3/2); trace moderate yellowish brown (10 YR 5/4) mottles; homogenous; consolidated; no sand; wet. 105 51.5-55.5' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.25/4.0' = 81%.CLAYSTONE: grayish black (N 2/0); abundant lignite stringers from 50.5-51.5'; organic rich; some sand; very fine-grained sand; dense; consolidated; dry. 109.72-119.37': Packer Test Interval #14. 55.5-60.0' SAMPLE. Recovered 4.5/4.5' = 100%. 110 RQD = 3.2/4.5' = 71%.CLAYSTONE: olive gray (5 Y 3/2); trace sand bottom 0.5'; dense; homogenous; moist. 60.0-65.0' SAMPLE. Recovered 1.6/5.0' = 32%. RQD = 0.5/1.6' = 31%.CLAYSTONE: olive gray (5 Y 3/2); some 115 very fine-grained silty sand; trace organics; dense; homogenous; moist. 65.0-68.0' SAMPLE. Recovered $2.95/3.0^{\circ} = 98\%$. RQD = 2.0/2.95' = 68%.SANDY CLAYSTONE: olive gray (5 Y

3/2); trace organic fragments; sandstone

at 66.1-67.1'; very fine-grained; silty;

moist to dry.

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Test Interval #13.

119.37-129.02': Packer

Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.26' Total Depth _ 174.00' Water Level Encountered 20.0' Static <u>5885.51'</u> (12/01/87) Driller N. Wheeler; P. Bushkovski Drilling Company Boyles Bros Helper D. Jarvie; K. Parker Date Drilled June 17-18, 1987; July 6-8, 1987 Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid None C.J. Wood; J.B. Bergman Checked By __ Geologist Site Manager CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. Samples Collected or Lithologic Description Other Tests Performed 68.0-72.0' SAMPLE. Recovered 3.0/4.0' = 75%. RQD = 3.0/3.0' = 100%.CLAYSTONE: olive gray (5 Y 3/2); abundant organics; consolidated; moist. 72.0-76.0' SAMPLE. Recovered 4.5/4.0' = 113%. RQD = 3.5/4.0' = 88%.125 CLAYSTONE: olive gray (5 Y 3/2); abundant organics; dense; moist. Last 1.0' grade to dusky green (5 G 3/2) claystone with no organics; silty; moist to dry. 76.0-80.0' SAMPLE. Recovered 3.2/4.0' = 80%. RQD = 1.85/3.2' = 58%.129.02-138.67': Packer 76.0-76.4: CLAYSTONE; olive gray (5 Y Test Interval #12. 130 3/2); silty; organic rich; dense; moist. SANDSTONE/CLAYSTONE: 76.4-77.2: 131.02-140.67': Packer olive gray (5 Y 3/2) and light olive gray Test Interval #11; (5 Y 5/2); interbedded medium-grained packers not sealing; sandstone; rounded; sorted; moist. aborted. 77.2-78.6': SANDSTONE olive gray (5 Y 3/2); well sorted; rounded; medium to 132.94-142.59': Packer fine-grained; salt & pepper texture; abun-Test Interval #10; dant organics; moist. failed test. 78.6-79.2': SANDSTONE same as above 135 but more clay; damp to dry. 134.94-144.59": Packer Test Interval 80.0-84.0' SAMPLE. #9: failed test. Recovered 4.0/4.0' = 100%. RQD = 3.5/4.0' = 88%.136.94-146.59': Packer CLAYSTONE: olive gray (5 Y 3/2); con-Test Interval #8, solidated; organic rich; homogenous; aborted test. damp.

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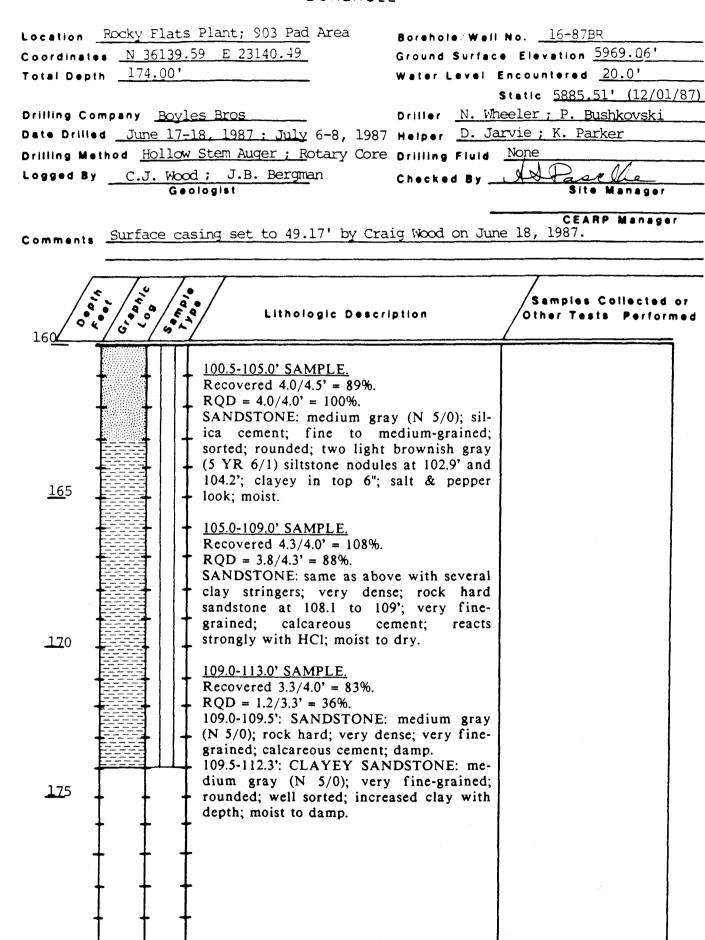
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Location Rocky Flats Plant; 903 Pad Area Borehole/Well No. 16-87BR Coordinates N 36139.59 E 23140.49 Ground Surface Elevation 5969.06' Total Depth 174.00' Water Level Encountered 20.0' **Stetic** <u>5885.51'</u> (12/01/87) Drilling Company Boyles Bros Driller N. Wheeler; P. Bushkovski Date Drilled June 17-18, 1987; July 6-8, 1987 Helper D. Jarvie; K. Parker Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid None Logged By C.J. Wood; J.B. Bergman Checked By _ Geologist Site Manager CEARP Manager Comments Surface casing set to 49.17' by Craig Wood on June 18, 1987. ,,, Samples Collected or Lithologic Description Other Tests Performed 140.21-149.86': Packer 84.0-88.0' SAMPLE. Test Interval #7: Recovered 4.0/4.0' = 100%. aborted test. ROD = 4.0/4.0' = 100%. 84.0-87.7': CLAYSTONE: same as above 142.21-151.86': Packer with some lignite stringers and trace Test Interval #6; sand; moist. aborted test. 87.7-88.0': SANDSTONE: olive gray (5 Y 3/2); very fine-grained; silty; common 144.71-154.36': Packer 145 organic fragments; moist. Test Interval #5; aborted test. 88.0-92.0' SAMPLE. Recovered 4.0/4.0' = 100%. 146.71-156.36': Packer RQD = 3.2/4.0' = 80%.Test Interval #4; CLAYSTONE: olive gray (5 Y 3/2); conaborted test. solidated; homogenous; trace organics; sandy top 3"; moist. 149.35-159.0': Packer Test Interval #3: 92.0-96.5' SAMPLE. 150 aborted test. Recovered 4.5/4.5' = 100%. RQD = 4.0/4.5' = 89%.151.35-161.0': Packer CLAYSTONE: same as above; moist to Test Interval #2: wet; with moderate yellowish brown (10 aborted test. YR 5/4) siltstone nodule at 94.0-94.5'; <1" wide; dry. 96.5-100.5' SAMPLE. Recovered $3.3/4.0^{\circ} = 83\%$. 155.0-163.30': Packer 155 ROD = 0/4.0' = 0%. Test Interval #1: 96.5-98.0': CLAYSTONE: olive gray (5 Y failed test. 3/2); two siltstone nodules, moderate yellowish brown (10 YR 5/4), approximate 1/4" diameter; elliptical; dry to moist. 98.0-99.8': SANDY CLAYSTONE: olive gray (5 Y 3/2); very fine-grained sand; well sorted; silty; moist.

or <u>13</u>

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| Location Rocky Flats Plant; 903 Pad Area | Borehole/Well No. 16-87BR |
|---|--|
| Coordinates N 36139.59 E 23140.49 | Ground Surface Elevation 5969.06' |
| Total Depth 174.00' | Water Level Encountered 20.0' |
| | Static <u>5885.51' (12/01/87)</u> |
| Drilling Company Boyles Bros | Driller N. Wheeler; P. Bushkovski |
| Date Drilled June 17-18, 1987; July 6-8, 1987 | |
| Drilling Method Hollow Stem Auger; Rotary Core | |
| | |
| Logged By C.J. Wood; J.B. Bergman Geologist | Checked By Site Manager |
| 460,05,00 | Otto Managar |
| | CEARP Manager |
| Comments Surface casing set to 49.17' by Cra | aig Wood on June 18, 1987. |
| | |
| | |
| Lithologic Descr | |
| Lithologic Descr | Samples Collected or Other Tests Performed |
| Lithologic Descr | / Const tests Performed |
| | |
| 117.0-121.0' SAMPLE. | |
| Recovered $5.0/4.0^{\circ} = 125\%$. | |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | DSTONE AND |
| SANDY CLAYSTONE: Sa | |
| with more clay; dense; mois | |
| T 118.0-121.0': SANDY CLAY | |
| + + um gray (N 5/0); fine- | 1 |
| rounded; well sorted; light | |
| — + + + (5 YR 6/1) siltstone noc | jule at 120.7'; |
| moist. | |
| T 1 1 1 2 5 0 5 4 1 5 1 5 1 | |
| $\frac{121.0-125.0' \text{ SAMPLE.}}{\text{Recovered } 3.7/4.0' = 93\%.}$ | |
| Recovered $3.7/4.0 = 93\%$. RQD = $3.7/3.7' = 100\%$. | |
| interbedded sandst | ONE/ CLAY- |
| STONE: medium gray (N 5 | , , , , , , , , , , , , , , , , , , , |
| grained; silty, clayey sands | |
| \ \ \ \ ded clay laminations; | · · · · · · · · · · · · · · · · · · · |
| rounded; dense; sorted; 10 | O dip on frac- |
| ture; cross-bedded; moist. | |
| 125 0 120 01 5 1 10 1 | |
| $\frac{125.0-129.0'}{Recovered 3.8/4.0'} = 95\%.$ | |
| RQD = 3.8/3.8' = 100%. | |
| INTERBEDDED SANDST | ONE/ CLAY- |
| + + STONE: same as above; same | • |
| 2" thick; clay beds 1-2" thi | |
| — † † brownish gray (5 YR 6/1) | siltstone nod- |
| ules 1" diameter; damp. | |
| | |
| $\frac{129.0-133.0'}{Page 2000000000000000000000000000000000000$ | |
| Recovered $3.0/4.0' = 75\%$. RQD = $3.0/3.0' = 100\%$. | |
| + + TINTERBEDDED SANDST | ONE/ CLAY- |
| STONE: same as above wi | |
| 7 0.8 to 1.0' thick. | |

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| ocation | Rocky Flats Plant; 903 Pad Area | Borehole/Well | No. <u>16-87BR</u> |
|-----------|--|--------------------------|--|
| oordina | N 36139.59 E 23140.49 | Ground Surface | Elevation <u>5969.06'</u> |
| otal De | pth <u>174.00'</u> | Water Level E | ncountered 20.0' |
| | | S | Static 5885.51! (12/01/8 |
| rilling C | company <u>Boyles Bros</u> | Driller N. Whe | eler; P. Bushkovski |
| ate Drii | June 17-18, 1987; July 6-8, | 1987 Helper <u>D. Ja</u> | rvie ; K. Parker |
| rilling N | Mothod Hollow Stem Auger; Rotary | Core Drilling Fluid | None |
| ogged E | By C.J. Wood; J.B. Bergman | Checked By | A Parche |
| | Geologist | | Site Manager |
| omment | Surface casing set to 49.17' by | Craig Wood on June | CEARP Manager = 18, 1987. |
| | | | |
| 0 | Lithologic D | escription | Samples Collected or Other Tests Performe |
| | 133.0-137.0' SAMPLE. | | |
| | Recovered $5.0/4.0' = 12$ | | |
| | RQD = 5.0/5.0' = 100% $SANDSTONE/SANDY$ | | |
| | dium gray (N 5/0); | | |
| | well sorted; rounded; | | |
| | fractures; moist to wet. | | ļ |
| | + + + | | |
| | 137.0-141.0' SAMPLE. | 1006 | |
| - | Recovered $4.0/4.0' = 10$ RQD = $4.0/4.0' = 100\%$ | | |
| | + + SANDSTONE/SANDY | | |
| | as above with mediu | | ŀ |
| | sand; damp. | | |
| | 1410145035435015 | | 1 |
| | $\frac{141.0-145.0' \text{ SAMPLE.}}{\text{Recovered } 3.9/4.0'} = 98$ | 20% | |
| | RQD = 3.7/3.9' = 95%. | J 70. | |
| | SANDSTONE: medium | gray (N 5/0); fine | |
| | to medium-grained | | |
| | rounded; silica cement | t; organic fragment | |
| | in shoe; damp. | | ·. • |
| | 145.0-149.0' SAMPLE, | | |
| | Recovered $3.2/4.0^{\circ} = 80$ |)%. | 1 |
| | RQD = 2.8/3.2' = 88%. | | |
| | + + SANDSTONE/CLAYS | | 1. |
| | DED: medium gray (1 1"; sand layers 3-6"; | | |
| | stone; dense; consolida | | 1 |
| | † † † ********************************* | | |
| | + + + | | |
| | | | |
| | + + + | | |
| | | j | |
| | † † † | } | |
| | 1 1 1 | P | |

| Location Rocky | Flats Plant; 903 Pad Area | Borehole/Wel | I No. 16-87BR |
|------------------|--|-----------------|---|
| Coordinates N | 36139.59 E 23140.49 | Ground Surfac | Elevation 5969.Q6' |
| Total Depth 17 | 4.00' | Water Level | Encountered 20.0' |
| | | | Stetic 5885.51' (12/01/87 |
| Drilling Company | Boyles Bros | Driller N. W | heeler; P. Bushkovski |
| | ne 17-18. 1987; July 6-8, 1987 | | arvie ; K. Parker |
| | Hollow Stem Auger; Rotary Core | Drilling Fluid | |
| _ | J. Wood ; J.B. Bergman | | |
| | Geologist | Checked By _ | Site Manager |
| | · | _ | |
| C | ing got to 40 171 by Cro | ia tiland on Tu | CEARP Manager |
| Comments Suria | ace casing set to 49.17' by Cra | ing wood on Jur | ne 18, 1987. |
| | | | |
| | . /. / | | |
| | / 3 / | | Samples Collected or |
| | Lithologic Descr | iption | Other Tests Performed |
| 7 | / 4 - / | | |
| | 149.0-153.0' SAMPLE. | | |
| + - | + Recovered 4.9/4.0' = 123%. | | |
| | RQD = 4.9/4.9' = 100%. | | |
| · • | + 149.0-149.6': CLAYEY SAN | | |
| | dium gray (N 5/0); very silty; rounded; damp. | rine-grained; | 1 |
| T | 149.6-153.0': CLAYSTONE: | olive grav (5 | |
| + - | Y 3/2); no sand; some orga | 0 - 1 | |
| | consolidated; moist. | | |
| _ † 1 | † † | | |
| ↓ ↓ | $\frac{153.0 - 157.0' \text{ SAMPLE.}}{\text{Recovered } 4.0/4.0' = 100\%.}$ | | |
| | Recovered $4.0/4.0 = 100\%$. RQD = $4.0/4.0' = 100\%$. | | |
| + 1 | SANDSTONE/CLAYSTON | E INTERBED- | |
| | DED: medium gray (N 5/ | | · |
| Ţ | grained sand; rounded; cro | | |
| + + | claystone layers 1"; sands | | |
| | dense; homogenous; few org | anics; moist. | |
| _ † 1 | 157.0-161.0' SAMPLE. | | |
| 1 1 | Recovered $3.7/4.0' = 93\%$. | | |
| | RQD = 3.2/3.7' = 86%. | | |
| † † | SANDSTONE: medium gray | | |
| 1 1 | clay lenses 1/4" to 4" wide | | |
| | fine to very fine-grained rounded; salt & pepper; v | | |
| + + | careous cemented sandsto | | |
| | 157.6'; moist to wet. | | |
| - † † | † | | |
| + + | • 🛉 | | |
| | | | , · · · · · · · · · · · · · · · · · · · |
| † † | † | | 1 |
| 1 1 | . ↓ | | |
| T | | | |
| + + | . ∔ | | |
| | 1 | | |

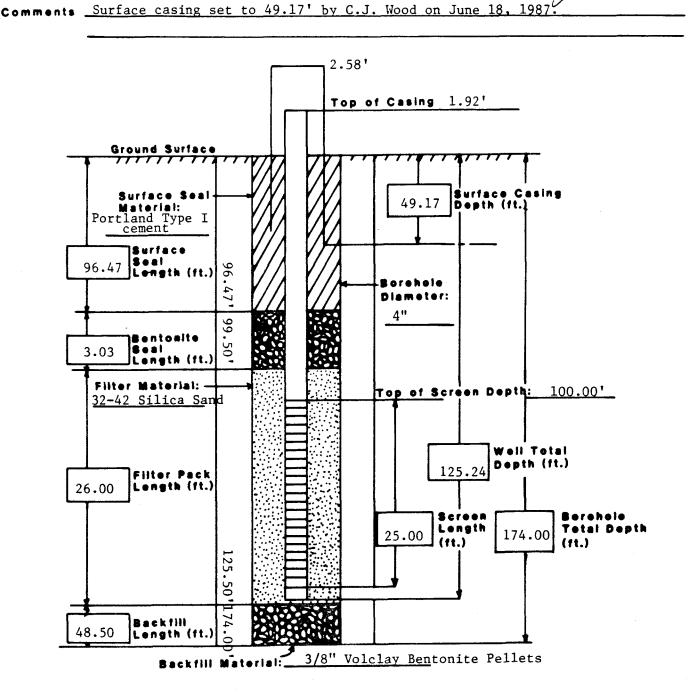
Page 12 of 13

| Well No. 16-87BR Intace Elevation 5969.06' Vel Encountered 20.0' Static 5885.51' (12/01/87 I. Wheeler; P. Bushkovski D. Jarvie; K. Parker None Static Manager CEARP Manager |
|---|
| June 18, 1987. |
| Samples Collected or Other Tests Performed |
| ght re- cts ray m- rell (5 ous; |
| |
| |

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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 903 Pad Area Well No. 16-87BR Coordinates N 36139.59 E 23140.49 Elevation: Ground Surface _5969.06' Total Depth: Well 125.24' Borehole 174.00' Formation of Completion Arabahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel 2" ID Casing Diameter Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter 1987 stainless steel Date installed July 14-16, Approved By installed By J.B. Bergman Geologist



PROGRAM SLUGT, VERSION 4.0CT, 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON THO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.J.NO.1 OF WRR ENTITLED
 - *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER*)
- (2) METHOD OF BOUMER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 16-87 9R

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH

DIAMETER OF DRILLED HOLE = 4.00 INCHES

ESTIMATED POROSITY OF SRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 22

LENGTH OF SCREEN OR INTAKE PORTION = 16.00 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 34.44 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 34.44 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING."0" IF RISING)

| TIME | HEAD |
|--------|--------|
| (sec) | (FEET) |
| 1.00 | 1.260 |
| 2.00 | 1.260 |
| 3.00 | 1.260 |
| 4.00 | 1.260 |
| 5.00 | 1.260 |
| 6.00 | 1.250 |
| 7.00 | 1.250 |
| 8.00 | 1.250 |
| 9.00 | 1.250 |
| 10.00 | 1.250 |
| | |

| 11.00 | 1.250 |
|---------|-------|
| 41.00 | 1.250 |
| 71.00 | 1.250 |
| 101.00 | 1.250 |
| 161.00 | 1.250 |
| 221.00 | 1.240 |
| 281.00 | 1.240 |
| 341.00 | 1.240 |
| 521.00 | 1.240 |
| 701.00 | 1.240 |
| 881.00 | 1.240 |
| 1091.00 | 1.240 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> 1.2526 1.2530

METHOD OF COOPER, BREDEHDEFT AND PAPADOPULOS

COMPUTED RESULTS:

COMPUTED VALUE OF HO = 1.27 FEET

| | NOTE: | TRANSMISSIVITY | y UNITS ARE IN | FT##2/sec | AND PERMEABIL | LITY UNITS ARE I | N FT/sec | |
|--------------------|-------------|-----------------------------|---------------------------|--------------------|-------------------|----------------------------------|--|----------------------|
| ALPHA | STORATIVITY | MEAN TRANSHIS- SIVITY | MEAN PERMEA- BILITY | HINIHUH TRANS. | MAXIMUM TRANS. | RATIO OF "T" RANGE TO "BAR | ROOT MEAN SQUARE OF TIME DEVIATIONS | DIFFERENCE IN RMS |
| 1.000 E -11 | 1.000E-01 | 5.066E-07 | 1.471E-08 | 7.778E-09 | 2.973E-06 | E. 352555 | 781.54 | .00 |
| 1.000E-01 | 1.000E-02 | 2.095E-06 | o.084E-08 | 4.738E-08 | 1.013E-05 | 4.911057 | 05 7.5 3 | 4.01 |
| 1.0008-03 | 1.000E-03 | 7.502E-06 | 2.178E-07 | 1.371E-07 | 3.981E-05 | 5.288136 | 359.91 | -2.38 |
| 1.000E-04 | 1.000E-04 | 1.499E-05 | 4.352E-07 | 2.447E-07 | 8.326E-05 | 5.539035 | 360.98 | -1.07 |
| 1.000E-05 | 1.000E-05 | 2.26BE-05 | 6.586E-07 | 3.521E-07 | 1.284E-04 | 5.645257 | 361.42 | 44 |
| 1.000E-06 | 1.000E-06 | 3.022E-05 | 8.776E-07 | 4.576E-07 | 1.728E-04 | 5.702072 | 361.63 | 21 |
| 1.000E-07 | 1.000E-07 | 3.762E-05 | 1.092E-06 | 5.599E-07 | 2.162E-04 | 5.733021 | 361.77 | 14 |
| 1.000E-08 | 1.000E-08 | 4.488E-05 | 1.303E-06 | 6.61 5 E-07 | 2.589E-04 | 5.753181 | 361.86 | 08 |
| 1.000E-09 | 1.000E-09 | 5.213E-05 | 1.514E-06 | 7.621E-07 | 3.016E-04 | 5.771000 | 361.92 | 07 |
| 1.000E-10 | 1.000E-10 | 5.921E-05 | 1.719E-06 | B.620E-07 | 3.427E-04 | 5.774183 | 361.95 | 03 |

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 9.52E-09 FT/sec = 2.90E-07 CM/sec

TRANSMISSIVITY = 3.28E-07 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.10E-08 FT/sec = 3.34E-07 CM/sec

TRANSMISSIVITY = 3.78E-07 FT##2/sec

WELL NO.: 16-87 BR

INPUT DATA ARE:

INMER CASING DIAMETER = 2.00 INCHES DIAMETER OF DRILLED HOLE = 4.00 INCHES ESTIMATED POROSITY OF GRAVEL PACK = .25 NUMBER OF HEAD-TIME DATA POINTS = 22

LENGTH OF SCREEN OR INTAKE PORTION = 26.00 FEET INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 34.44 FEET THICKNESS OF SATURATED AQUIFER IDNE = 34.44 FEET FALLING-HEAD INDEX = 0 ("1" IF FALLING, "0" IF RISING)

| TIME | HEAD |
|--------|-------|
| sec | (FEET |
| 1.00 | 1.250 |
| 2.00 | 1.260 |
| 3.00 | 1.260 |
| 4.00 | 1.260 |
| 5.00 | 1.260 |
| 6.00 | 1.250 |
| 7.00 | 1.250 |
| 8.00 | 1.250 |
| 9.00 | 1.250 |
| 10.00 | 1.250 |
| 11.00 | 1.250 |
| 41.00 | 1.250 |
| 71.00 | 1.250 |
| 101.00 | 1.250 |
| 161.00 | 1.250 |
| 221.00 | 1.240 |
| 281.00 | 1.240 |
| 341.00 | 1.240 |
| 521.00 | 1.240 |
| 701.00 | 1.240 |

891.00 1.240 1091.00 1.240

HO WAS COMPUTED FROM KNOWN VOLUME OF SLUG VOLUME OF SLUG ENTERED = .03270 CUBIC FEET

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS COMPUTED RESULTS:

COMPUTED VALUE OF HO = 1.50 FEET

| | NOTE: | TRANSMISSIVIT | Y UNITS ARE IN | FT++2/sec | AND PERMEABIL | LITY UNITS ARE I | N FT/sec | |
|-----------|--------------------|-----------------------------|---------------------------|-------------------|-------------------|----------------------------------|--|----------------------|
| ALPHA | STORATIVITY | HEAN TRANSHIS- SIVITY | MEAN PERMEA- BILITY | MINIMUM TRANS, | MAXIMUM TRANS. | RATIO OF "T" RANGE TO TBAR | ROOT MEAN SQUARE OF TIME DEVIATIONS | DIFFERENCE IN RMS |
| 1.000E-31 | 1.000E-01 | 4.057E-05 | 1.178E-06 | 3.020E-07 | 2.826E-04 | 6.959200 | 365.92 | .00 |
| 1.000E-02 | 1. 000E -02 | 1.285E-04 | 3.730E-06 | 9.317E-07 | 8.989E-04 | 6.989861 | 366.03 | 11 |
| 1.000E-03 | 1.000E-03 | 2.392E-04 | 6.946E-06 | 1.713E-06 | 1.677E-03 | 7.004902 | 366.08 | 05 |
| 1.000E-04 | 1.000E-04 | 3.509E-04 | 1.019E-05 | 2.499E-06 | 2.463E-03 | 7.011212 | 366.10 | 02 |
| 1.000E-05 | 1.000E-05 | 4.600E-04 | 1.336E-05 | 3.266E-06 | 3.230E-03 | 7.014784 | 366.12 | 01 |
| 1.000E-0a | 1.000E-06 | 5.671E-04 | 1.647E-05 | 4.019E-06 | 3.983E-03 | 7.016734 | 366.12 | 01 |
| 1.0008-17 | 1.000E-07 | 6.727E-04 | 1.9538-05 | 4.762E-0s | 4.725E-03 | 7.018092 | 366.13 | .00 |
| 1.000E-08 | 1.000E-08 | 7.772E-04 | 2.257E-05 | 5.498E-0a | 5.461E-03 | 7,019024 | 266.13 | .00 |
| 1.000E-1= | 1.000E-09 | B.811E-04 | 2.558E+05 | 6.229E-06 | 5.191E-03 | 7.019701 | 366.13 | .00 |
| 1.000E-10 | 1.000E-10 | 9.844E-04 | 2.858E-05 | 6.955E-Ú6 | 6.917E-03 | 7.020319 | 366.14 | .00 |

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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02 DATE TESTED: 7/14/87 BY: J.B. BERGMAN TEST INTERVAL (FEET BELOW G.S.): 48.41 - 58.06

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN) L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS ABOVE WATER TABLE

= 53.24 + 8.30 + .00 * 2.31 = 61.53 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000630 FT/MIN
 K = .00000003 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/14/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 55.90 - 65.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

$$K = ---- LN(--)$$
 $2(PI)(L)(H)$
 R

1ST P1/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 60.73 + 8.37 + .00 * 2.31 = 69.10
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000702 FT/MIN K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00076023 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 60.73 + 5.72 + 11.00 * 2.31 = 91.86
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000005542 FT/MIN K = .00000028 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02 DATE TESTED: 7/14/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 57.90 - 67.55

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 103.08

> L K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 62.73 + 8.31 + .00 * 2.31 = 71.04

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000136 FT/MIN

K = .00000001 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02

DATE TESTED: 7/14/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 67.55 - 77.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} L$

1ST P1/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 72.38 + 8.41 + .00 * 2.31 = 80.79
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001200 FT/MIN

K = HYDRAULIC CONDUCTIVITY = .0000001200 FT/MIN K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00155665 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 72.38 + 5.72 + 14.00 * 2.31 = 110.43
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000009438 FT/MIN<math>K = .00000048 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00031133 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 72.38 + 7.92 + .00 * 2.31 = 80.29
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002596 FT/MIN K = .00000013 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 69.55 - 79.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00097019 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.38 + 7.51 + .00 • 2.31 = 81.89
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000079 FT/MIN K = .00000040 CM/SEC

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PACKER TEST ANALYSIS
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WELL NO. 16-87BR

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02

DATE TESTED: 7/13/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 103.08

1ST P1/3 TEST

Q = INJECTION RATE = .00190418 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 7.85 + .00 * 2.31 = 91.72

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000139 FT/MIN

K = .00000071 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00638589 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 5.72 + 16.00 * 2.31 = 126.56

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000338 FT/MIN

K = .00000172 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00099915 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 7.30 + .00 * 2.31 = 91.18

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000073 FT/MIN

K = .00000037 CM/SEC

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PACKER TEST ANALYSIS WELL NO. 16-87BR
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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 93.52 + 8.31 + .00 • 2.31 = 101.83

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN K = .00000000 CM/SEC

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000277 FT/MIN K = .00000141 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 93.52 + 8.60 + .00 * 2.31 = 102.12
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN K = .00000002 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 90.70 - 100.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00438035 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 95.52 + 8.76 + .00 * 2.31 = 104.28
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000028124 FT/MIN
 K = .00000143 CM/SEC

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PACKER TEST ANALYSIS WELL NO. 16-87BR
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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 100.50 - 110.15
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00044889 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 105.32 + 8.20 + .00 * 2.31 = 113.52
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000026 FT/MIN K = .00000013 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00615420 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 105.32 + 5.72 + 21.00 * 2.31 = 159.55
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000258 FT/MIN<math>K = .00000131 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00044889 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 105.32 + 9.12 + .00 * 2.31 = 114.44
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000026 FT/MIN K = .00000013 CM/SEC

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PACKER TEST ANALYSIS WELL NO. 16-87BR
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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 109.72 - 119.37
MATERIAL TESTED: ARAPAHOE SANDSTONE

MATERIAL TESTED: ARAPAHOE SANDSTONE DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00044165 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 8.16 + .00 * 2.31 = 111.24

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000027 FT/MIN

K = .00000014 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01198984 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 5.72 + 24.00 * 2.31 = 164.24

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000489 FT/MIN

K = .00000248 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00068782 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 8.29 + .00 * 2.31 = 111.37

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN

K = .00000021 CM/SEC

```
PACKER TEST ANALYSIS WELL NO. 16-87BR
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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/13/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 119.37 - 129.02
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

$$K = ---- LN(--)$$

2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00046338 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 103.08 + 8.30 + .00 * 2.31 = 111.38

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN K = .00000014 CM/SEC

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000779 FT/MIN K = .00000396 CM/SEC

2ND P1/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN K = .00000014 CM/SEC

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PACKER TEST ANALYSIS WELL NO. 16-87BR
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ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/10/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 129.02 - 138.67

MATERIAL TESTED: ARAPAHOE SANDSTONE DEPTH TO WATER (FEET BELOW G.S.): 103.08

K = ---------- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00099295 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET) = 103.08 + 7.90 + .00 * 2.31 = 110.98

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000060 FT/MIN

K = .00000030 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00491819 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET) = 103.08 + 5.72 + 28.00 * 2.31 = 173.48

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000190 FT/MIN

K = .00000096 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00078350 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 7.97 + .00 * 2.31 = 111.05

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000047 FT/MIN

K = .00000024 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/10/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 131.02 - 140.67
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00000776 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 103.08 + 8.10 + .00 * 2.31 = 111.18
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000047 FT/MIN K = .00000000 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/10/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 134.94 - 144.59
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

$$K = \frac{Q}{2(PI)(L)(H)} LN(--)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000078 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 103.08 + 8.26 + .00 * 2.31 = 111.34
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .000000005 FT/MIN
K = .00000000 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 16-87BR

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02 DATE TESTED: 7/10/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 144.71 - 154.36

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 103.08

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00054302 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 7.77 + .00 * 2.31 = 110.85

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000033 FT/MIN

K = .00000017 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02 DATE TESTED: 7/10/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 146.71 - 156.36

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 103.08

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00106276 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 103.08 + 8.19 + .00 * 2.31 = 111.27

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000064 FT/MIN

K = .00000032 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02 DATE TESTED: 7/9/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 151.35 - 161.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 103.08

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$

1ST P1/3 TEST

Q = INJECTION RATE = .00009309 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET) = 103.08 + 9.64 + .00 * 2.31 = 112.72

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000553 FT/MIN<math>K = .00000003 CM/SEC

ROCKY FLATS PLANT; 903 PAD AREA JOB NO. 2029-17-02
DATE TESTED: 7/9/87 BY: J. B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 153.35 - 163.00
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 103.08

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00008533 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 103.08 + 9.37 + .00 * 2.31 = 112.45
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000508 FT/MIN<math>K = .00000003 CM/SEC

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 903 Pad Area

Well No.: 16-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663

Static Water Level: 103.08"

Date of Water Level: 10/26/87

Page 1 of 4 Comments: Test Intervals # 1-11, 16, 19, 21, 23 failed on

2/3 pressure test due to improper packer seal.

| 0 5.72 3.65 9.37 0.055 7/9/87 Kass 33.83 5.72 - - - 7/9/87 Kass - 5.72 - - - 7/9/87 Kass 0 5.72 - - - 7/9/87 Kass - 5.72 - - 7/9/87 KCL - 5.72 - - 7/9/87 KCL - 5.72 - - 7/9/87 KCL 0 5.72 - - 7/9/87 KCL - 5.72 - - 7/9/87 KCL - 5.72 - - 7/9/87 KCL - 5.72 - - 7/10/87 KCL - 5.72 2.47 8.19 0.685 7/10/87 KCL - 5.72 - - - 7/10/87 KCL - | Took Interval | Top of Test | Bottom of | Teet Length | Gege | George Heiner | AVB. H20 | Gage Helekt | 4 | 100 000 | | |
|--|---------------|-------------|-----------|-------------|-------------|---------------|----------|-------------|-------|---------|------------|----------|
| 153.35 163.00 14 0 5.72 3.65 9.37' 0.055 7/9/87 Kass 15.135 161.00 - 33.83 5.72 - - 7/9/87 Kass 15.135 161.00 14 0 5.72 - - 7/9/87 Kass 15.135 161.00 14 0 5.72 - - 7/9/87 KGL 149.35 165.00 14 0 5.72 - - 7/9/87 KGL 149.35 159.00 14 0 5.72 - - 7/9/87 KGL 149.36 159.00 14 0 5.72 - - 7/9/87 KGL 140.71 156.36 14 0 5.72 - - 7/9/87 KGL 146.71 156.36 14 0 5.72 - - 7/10/87 KGL 147.71 154.36 14 0 | Ž | | | (memores) | The section | | Height | Height | ס | | (0.000.00) | Neosoen. |
| 151.35 161.00 14 0 5.72 - | 1 | 153.35 | 163.00 | 14 | 0 | 5.72 | 3.65 | 9.37 | 0.055 | 7/9/87 | Kass | JISIS |
| 151.35 161.00 14 0 5.72 - 0 - 0 7/9/87 Kass 151.35 161.00 14 0 5.72 3.92 9.64 0.06 7/9/87 Kul. 149.35 159.00 14 0 5.72 3.20 8.92 0.00 7/9/87 Kul. 149.35 159.00 14 0 5.72 3.20 8.92 0.00 7/9/87 Kul. 146.71 156.36 14 0 5.72 2.47 8.19 0.665 7/10/87 Kul. 144.71 154.36 14 0 5.72 2.47 8.19 0.685 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.35 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.05 7.77 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 Kul. 142.21 151.86 14 0 5.72 2.90 14 0 0.00 7/10/87 Kul. 142.21 151.86 14 0 0.20 14 0 0.00 7/10/87 Kul. 142.21 151.86 14 0 0.20 0.00 7/10/87 Kul. 142.21 151.86 14 0 0.20 0.00 7/10/87 Kul. 142.21 151.86 14 0 0.20 0.00 7/10/87 Kul. 142.21 142 | | | | - | 33.83 | 5.72 | _ | 1 | 1 | 7/9/87 | Kass | JBIS |
| 151.35 161.00 14 0 5.72 3.92 9.64 0.06 7/9/87 КСІ. 149.35 161.00 14 0 5.72 - - 7/9/87 КСІ. 149.35 159.00 14 0 5.72 3.20 8.92 0.00 7/9/87 КСІ. 146.71 156.36 14 0 5.72 3.20 8.92 0.00 7/9/87 КСІ. 146.71 156.36 14 0 5.72 - - 7/9/87 КСІ. 146.71 156.36 14 0 5.72 - - 7/9/87 КСІ. 144.71 156.36 14 0 5.72 - - 7/10/87 КСІ. 142.21 154.36 14 0 5.72 - - 7/10/87 КСІ. 142.21 151.86 14 0 5.72 - - 7/10/87 КСІ. 142.21 151. | | | | ' | ı | 5.72 | ı | 1 | ŧ | 7/9/87 | Kass | JBB |
| 149.35 - - 5.72 - - 7/9/87 KCL 149.35 159.00 14 0 5.72 - - 7/9/87 KCL 146.71 156.36 14 0 5.72 - - 7/9/87 KCL 146.71 156.36 14 0 5.72 - - 7/9/87 KCL 146.71 156.36 14 0 5.72 - - 7/9/87 KCL 146.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 KCL 147.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 KCL 144.71 154.36 14 0 5.72 2.05 - 7/10/87 KCL 142.21 151.86 14 0 5.72 2.05 - 1/10/87 KCL 142.21 151.86 14 0 | 2 | 151.35 | 161.00 | 14 | 0 | 5.72 | 3.92 | 9.64 | 90.0 | 78/6/7 | KCI, | JBB |
| 149.35 159.00 14 0 5.72 - - 7/9/87 KCL 149.35 159.00 14 0 5.72 3.20 8.92 0.00 7/9/87 KCL 146.71 156.36 14 0 5.72 - - 7/9/87 KCL 146.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 KCL 144.71 154.36 14 0 5.72 2.47 8.19 0.685 7/10/87 KCL 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 KCL 142.21 151.86 14 0 5.72 - - 7/10/87 KCL 142.21 151.86 14 0 5.72 - - 7/10/87 KCL 142.21 151.86 14 0 5.72 - - 7/10/87 KCL 142. | | | | ı | 1 | 5.72 | 1 | - | - | 78/6/7 | KCL | JBB |
| 149.35 159.00 14 0 5.72 3.20 8.92 0.00 7/9/87 KCI. 4.4.71 - - - - 7/9/87 KCI. 146.71 156.36 14 0 5.72 - - 7/9/87 KCI. 146.71 156.36 14 0 5.72 - - 7/10/87 KCI. 144.71 154.36 14 0 5.72 - - 7/10/87 KCI. 144.71 154.36 14 0 5.72 - - 7/10/87 KCI. 142.21 154.36 14 0 5.72 - - 7/10/87 KCI. 142.21 151.86 14 0 5.72 - - 7/10/87 KCI. 142.21 151.86 14 0 5.72 - - 7/10/87 KCI. 142.21 151.86 14 0 5.72 - | | | | 1 | - | 5.72 | i | - | | 7/9/87 | KCL | JBB |
| 146.71 156.36 - - 5.72 - - 7/9/87 KCI. 146.71 156.36 14 0 5.72 - - 7/9/87 KCI. 146.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 KCI. 144.71 154.36 14 0 5.72 - - 7/10/87 KCI. 142.21 151.86 14 0 5.72 2.05 7/10 7/10/87 KCI. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCI. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCI. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCI. 142.21 151.86 1 - 5.72 - - 7/10/87 KCI. | 3 | 149.35 | 159.00 | 14 | 0 | 5.72 | 3.20 | 8.92 | 00.00 | 7/9/87 | KC1. | JBB |
| 146.71 156.36 - - 5.72 - - 7/9/87 КСТ. 146.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 КСТ. 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 КСТ. 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 КСТ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСТ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСТ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСТ. 1 - - 5.72 - - 7/10/87 КСТ. 1 - - 5.72 - - 7/10/87 КСТ. <td< td=""><th></th><td></td><td></td><td>1</td><td>1</td><td>5.72</td><td>Į</td><td>1</td><td></td><td>L8/6/L</td><td>KCI.</td><td>JBB</td></td<> | | | | 1 | 1 | 5.72 | Į | 1 | | L8/6/L | KCI. | JBB |
| 146.71 156.36 14 0 5.72 2.47 8.19 0.685 7/10/87 КСІ. 144.71 - - - 5.72 - - 7/10/87 КСІ. 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 9.62 0.00 7/10/87 КСІ. 142.21 14.2.21 14.2.21 14.2.21 14.2.21 14.2 | | | | 1 | ı | 5.72 | 1 | ı | 1 | L8/6/L | KCT, | JBB |
| 144.71 154.36 - - 5.72 - - 7/10/87 KCL 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 KCL 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL 142.21 151.86 - - 5.72 - - - 7/10/87 KCL | 4 | 146.71 | 156.36 | 14 | 0 | 5.72 | 2.47 | 8.19 | 0.685 | 7/10/87 | KCI, | JBB |
| 144.71 154.36 14 0 5.72 - - 7/10/87 КСІ. 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 КСІ. 142.21 151.86 14 0 5.72 - - 7/10/87 КСІ. 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 КСІ. 1 - - - 5.72 - - 7/10/87 КСІ. 1 - - - - 7/10/87 КСІ. 1 - - - - 7/10/87 КСІ. | | | | 1 | Ī | 5.72 | 1 | • | - | 7/10/87 | KCL | JBB |
| 144.71 154.36 14 0 5.72 2.05 7.77 0.35 7/10/87 KCL 142.21 - - - 7/10/87 KCL 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL 1 - - 5.72 - - 7/10/87 KCL | | | | ı | ĵ | 5.72 | • | 1 | 1 | 7/10/87 | KCL | JBB |
| 42.21 151.86 14 0 5.72 - - 7/10/87 KCL 42.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL - - - 5.72 - - 7/10/87 KCL - - 5.72 - - 7/10/87 KCL - - 5.72 - - 7/10/87 KCL | 5 | 144.71 | 154.36 | 14 | 0 | 5.72 | 2.05 | 7.77 | 0.35 | 2/10/87 | KCL | JBB |
| 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCL - - - 5.72 - - 7/10/87 KCL - - 5.72 - - 7/10/87 KCL - - 5.72 - - 7/10/87 KCL | | | | - | 1 | 5.72 | | 1 | | 7/10/87 | KCL | JBB |
| 142.21 151.86 14 0 5.72 2.90 8.62 0.00 7/10/87 KCI. - - - 5.72 - - 7/10/87 KCI. - - 5.72 - - 7/10/87 KCI. | | | | 1 | ı | 5.72 | I | ı | ı | 7/10/87 | KCL | JBB |
| - 5.72 7/10/87 KCL - 5.72 7/10/87 KCL | 9 | 142.21 | 151.86 | 14 | 0 | 5.72 | 2.90 | 8.62 | 00.00 | 7/10/87 | KCI, | JBB |
| - 5.72 7/10/87 KCL | | | | ı | 1 | 5.72 | 1 | 1 | | 7/10/87 | KCL | JBB |
| | | | | 1 | 1 | 5.72 | - | 1 | | 7/10/87 | KCL | JBB |
| | | | | | | | | | | | | |

Date of Water Level: 10/25/87 Static Water Level: 103.08' Page 2_ of 4 PACKER TEST DATA SHEET Comments:_ Location: Rocky Flats Plant; 903 Pad Area Acrylic Tube Diameter: 0.1663' Borehole Diameter: 0.333' Well No.: 16-87BR (CON'T) Job No.: 2029-17-02

| Test Interval No. | Top of Test Interval | Bottom of Test Interval | Test Length (minutes) | Gage Pressure | Gage Height | Avg. H ₂ O Height | Gage Helght •Avg. H ₂ O Helght | Δħ | Date of Test | LBrokegy | Geologiet |
|----------------------|-------------------------|----------------------------|--------------------------|------------------|-------------|---------------------------------|---|-------|--------------|----------|-----------|
| 7 | 140.21 | 149.86 | 14 | 0 | 5.72 | 1.99 | 7.71 | 0.00 | 7/10/87 | KCI, | JBP |
| | | | - | 1 | 5.72 | t | | - | 7/10/87 | KCI, | JBB |
| | | | - | J | 5.72 | i | 1 | 1 | 7/10/87 | KCL | JRB |
| 8 | 136.94 | 146.59 | 14 | 0 | 5.72 | 2.40 | 8.12 | 00.00 | 7/10/87 | KCI. | JBB |
| | | | ı | 1 | 5.72 | I | 1 | ı | 7/10/87 | KCI. | JBR |
| | | | 1 | 1 | 5.72 | 1 | 1 | ı | 7/10/87 | KCI | JBB |
| 9 | 134.94 | 144.59 | 14 | 0 | 5.72 | 2.54 | 8.26 | 0.005 | 7/10/87 | KCI, | JEB |
| | | | i | 1 | 5.72 | | 1 | ı | 7/10/87 | KCL | HH |
| | | | 1 | ļ | 5.72 | 1 | 1 | 1 | 7/10/87 | KCL | JBB |
| 10 | 132.94 | 142.59 | 14 | 0 | 5.72 | 2.45 | 8.17 | 00.00 | 7/10/87 | Kass | JPP |
| | | | | | 5.72 | 3 | ı | 1 | 7/10/87 | Kass | JBB |
| | | | 1 | 1 | 5.72 | t | - | ŧ | 7/10/87 | Kass | JBB |
| 11 | 131.02 | 140.67 | 14 | 0 | 5.72 | 2.38 | 8.10 | 0.005 | 7/10/87 | Kass | JBB |
| | | | - | ı | 5.72 | 1 | I | 1 | 7/10/87 | Kass | JBB |
| | | | 1 | ı | 5.72 | ì | 1 | l | 7/10/87 | Kass | JBB |
| 12 | 129.02 | 138.67 | 14 | 0 | 5.72 | 1.18 | 7.90 | 0.64 | 7/10/87 | Kass | JBB |
| | | | 14 | 28 | 5.72 | N/N | 5.72 | 3.17 | 7/10/87 | Kass | HH |
| | | | 14 | 0 | 5.72 | 2.25 | 7.97 | 0.505 | 7/10/87 | Kass | HEL |
| | | | | | | | | | | | |

| | | | | PACKER | TEST | DATA SH | SHEET | | | | |
|----------------------|-------------------------------|----------------------------|--------------------------|--------|-------------|---------------------------------|---|--------|--------------|-------------------------------|-----------|
| Job No. | Job No.: _2029-17-02 | | | | | | | | Static Wal | Static Water Level: 103.08 | 103.08 |
| Location: | Location: Rocky Flats | Plant; | 903 Pad Area | | | | | | Date of W | Date of Water Level: 10/26/87 | 10/26/87 |
| Well No.: | 16-87BR | (CON'T) | | | | | | | Page 3 | of 4 | |
| Borehole | Borehole Diameter: | 0.333 | | °S | Comments: | | | | | | |
| Acrylic Tu | Acrylic Tube Diameter: 0.1663 | or: 0.1663' | | | 1 1 | | | | | | |
| Test Interval No. | Top of Teet Interval | Bottom of Teet Interval | Teet Length (minutes) | Gage | Gage Height | Ave. H ₂ O Height | Gage Height +Avg. H ₂ O Height | Δħ | Date of Test | Liftology | Geologist |
| 13 | 119.37 | 129.02 | 15 | 0 | 5.72 | 2.58 | 8.30 | 0.32 | 7/13/87 | KC1. | JBR |
| | | | 15 | 26 | 5.72 | N/A | 5.72 | 13.575 | 7/13/87 | KCT. | TBE |
| | | | 15 | 0 | 5.72 | 2.85 | 8.57 | 0.325 | 7/13/87 | KCI, | JBR |
| 14 | 109.72 | 119.37 | 15 | 0 | 5.72 | 2.44 | 8.16 | 0.305 | 7/13/87 | Kass | JBB |
| | | | 15 | 24 | 5.72 | N/A | 5.72 | 8.28 | 7/13/87 | Kass | JBB |
| | | | 15 | 0 | 5.72 | 2.57 | 8.29 | 0.475 | 7/13/87 | Kass | JBB |
| 15 | 100.50 | 110.15 | 15 | 0 | 5.72 | 2.48 | 8.20 | 0.31 | 7/13/87 | Kass | JBB |
| | | , | 15 | 21 | 5.72 | N/A | 5.72 | 4.25 | 7/13/87 | Kass | JBB |
| | | | 15 | 0 | 5.72 | 3.40 | 9.12 | 0.31 | 7/13/87 | Kass | JBB |
| 16 | 90.70 | 100.35 | 15 | 0 | 5.72 | 3.04 | 8.76 | 3.025 | 7/13/87 | KCL | JBB |
| | | | | ı | 5.72 | 1 | ı | 1 | 7/13/87 | KCI, | JBB |
| | | | ı | 1 | 5.72 | ı | | i | 7/13/87 | KCL | JBB |
| 17 | 88,70 | 98.35 | 15 | Û | 5.72 | 2.59 | 8.31 | 0.0 | 7/13/87 | KCT, | ,TRI? |
| | | | 15 | 18 | 5.72 | N/A | 5.72 | 4.03 | 7/13/87 | KCL | JBB |
| | | | 15 | 0 | 5.72 | 2.88 | 8.60 | 0.04 | 7/13/87 | KCL | JBB |
| 18 | 79.05 | 88,70 | 15 | 0 | 5.72 | 2.13 | 7.85 | 1.315 | 7/13/87 | KCL | JBB |
| | | | 15 | 16 | 5.72 | N/A | 5.72 | 4.41 | 7/13/87 | KCL | JBB |
| | | | 15 | 0 | 5.72 | 1.58 | 7.30 | 69.0 | 7/13/87 | KCL | JBB |
| | | | | | | | | | | | |

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; 903 Pad Area

Well No .: 16-87BR (CON'T)

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0,1663'

Comments:

Static Water Level: 103.08'

Date of Water Level: 10/26/87

| 800 4 of 4 | |
|------------|--|
| 1 | |
| | |

| Tool Interval | 100 00 722 | | | | - | | | | | | |
|---------------|------------|-----------|-------------|-------|-------------|---------|------------|-------|-------------|-------|-----------|
| % | Mervei | Too motor | Test Length | Q. | | Ave. H. | Geor House | | | | |
| 19 | 25 05 | | (mmotes) | 70000 | Nego House | Heigh | *Avg. H20 | 4 | Date of Tea | 1 | |
| 173 | 68.55 | 79.20 | 15 | 0 | 5.72 | 1.79 | 7 51 | | | | neologie: |
| | | | ı | 1 | 5.72 | | 10.1 | 0.0/ | 7/13/87 | KCL | JBB |
| | | | 1 | | | | 1 | - | 7/13/87 | KCL | JEBS |
| 20 | 67.55 | 77.20 | 15. | | 5.72 | | 1 | | 7/13/87 | KCT | i de |
| | | | CT | 0 | 5.72 | | 8.41 | 0.10 | 78/81/7 | INCL) | JBE |
| | | | 15 | 14 | 5.72 | | 1 | | 10/57// | NCL. | JBB |
| | | | 15 | 0 | 5.72 | | 27.5 | 1.075 | 7/14/87 | KCL | JBE |
| 72 | 57.90 | 67.55 | 15 | | 71.0 | 1 | 7.92 | 0.215 | 7/14/87 | KCL | JBB |
| | | | 1 | | 2.12 | 2.59 | 8.31 | 0.01 | 7/14/87 | KCT | É |
| | | | | 1 | 5.72 | 1 | ı | | 7/11/02 | | JBB |
| | † | | - | 1 | 5.72 | | | | //14/8/ | KCI, | JBB |
| 77 | 55.90 | 65,55 | 15 | c | 7 | 1 | 1 | ! | 7/14/87 | KCL | .TBB |
| | | | 15 | | 27.5 | 2.65 | 8.37 | 0.05 | 7/14/87 | VC*1 | 100 |
| | | | - | T | 5.72 | N/A | 5.72 | 0.525 | 7/11/02 | NC.L. | JER |
| | + | | 15 | 0 | 5.72 | 2 64 | 20 | 0.36. | //14/8/ | KCL | JBB |
| 23 | 48.41 | 58.06 | 15 | | | | 8.30 | 0.00 | 7/14/87 | KCL | JBB |
| | | | | | 27.5 | 2.58 | 8.30 | 0.04 | 7/14/87 | KCL | TRR |
| | | | | | 5.72 | - | , | 1 | 7/14/87 | KCL | TEI. |
| | | | | 1 | 5.72 | ı | ı | | 7/14/87 | KCT | |
| | | + | | | | | | | | | JBB |
| | | | | | | | | | | | |
| | | | | | + | | | | | | |
| - | | | + | + | | | | | | | |
| | 1 | 1 | | | | | | | + | | |
| | | | | - | | | | | | | |

12.11/87

Water Level Data for Rockwell (Rocky Flats)

| Date Measured | Depth to Water from TOC | Elevation TOC (ft) | Water Level Elev. (ft) |
|------------------|-------------------------|-----------------------|---------------------------|
| ** Well Number | : 1687BR 104.30 | 5970.98 | 5866.68 |
| 12/01/87 | 85.47 | 5970.98 | 5885.51 |

INDEX OF DATA

| Boring | No.: 17-87 |
|----------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> </u> | Log of Borehole |
| X_ | Well Construction Summaries |
| | Well Development Summaries |
| X | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| <u> </u> | Water Level Data |

Coordinates N 36424.92 E 23200.70

Total Depth 30.30'

Drilling Company Boyles Bros Drill Date Drilled September 9, 1987

Drilling Method Hollow Stem Auger Drill Logged By R.T. Treat Che Geologist

20

Borehole/Well No. 17-87

Ground Surface Elevation 5965.56

Water Level Encountered None

Static 5951.20' (12/01/87)

Driller R. Sharp

Helper S. Bradfield

Drilling Fluid None

Checked By Asselled

Samples Collected or Lithologic Description Other Tests Performed **TOPSOIL** HNU Background=0.6 0.0-2.0' SAMPLE. OVA Background=0.0 Recovered 1.6/2.0'=80%. Ludlum Background= 0-0.3': TOPSOIL: organic roots with some 0.0 silty sands. **ROCKY FLATS ALLUVIUM** 3.5-5.0': Readings on 5 core: HNU = 1.2; 0.3-2.0': CLAYEY GRAVELS: gravish OVA = 0.0. brown (5 YR 3/2) quartzite gravels; angular, with angular and subangular cobbles; slightly sandy; poorly sorted; mas-5.0-6.5': Readings on sive; moist. core: HNU = 0.0: OVA = 1.8. 2.0-3.5' SAMPLE. Recovered 1.5/1.5' = 100%. GRAVEL AND CLAYEY SAND: moder-10 ate orange pink (5 YR 8/4); weakly cemented; very calcareous; sands 2.5-2.0 phi up to 0.5mm to 3.0mm gravels; scattered quartzite cobbles; angular and subangular; poorly sorted; slightly moist. 3.5-5.0' SAMPLE. Recovered 0.8/1.5'=53%. SANDY GRAVELS: very pale orange (10 <u>15</u> YR 8/2) to grayish orange (10 YR 7/4); scattered quartzite gravel and cobbles up to 7.0mm; sands (2.0-1.5 phi) poorly sorted, angular to subangular; slightly to moderately calcareous; weakly cemented; slightly moist.

| Location RC | ocky Flats Plant; Mound Area | Borehole/Well | No. <u>17-87</u> |
|---------------|---|-----------------------|----------------------------|
| Coordinates | N 36424.92 E 23200.70 | | • Elevation <u>5965.56</u> |
| Total Depth | 30.30' | Water Level | Encountered None |
| • | | | Static 5951.20' (12/01/87 |
| Drilling Comp | Boyles Bros | Driller R. Sh | arp |
| | September 9, 1987 | Helper S. Br | adfield |
| | Hollow Stem Auger | Drilling Fluid | None |
| Logged By | | | dyD all |
| 10,,,,, | Geologist | Checked By _ | Site Manager |
| | | _ | |
| | | | CEARP Manager |
| Comments - | | | |
| · | | | |
| | /4 /- / | | |
| / 35 | Lithologic | | Samples Collected or |
| | Lithologic | Description | Other Tests Performed |
| 20 | 6 1/6-/ | | |
| | 5.0-6.5' SAMPLE. | | |
| #: | Recovered 1.5/1.5' = | 100%. | |
| | | L: grayish orange (10 | |
| +: | | gravel and cobbles | i ! |
| | | i; sand 1.5-1.0 phi, | 1 |
| 1 | | oorly sorted; angular | 1 |
| 4 | moist. | and gravel; slightly | |
| 25 | moist. | | 1 |
| <u>25</u> | 6.5-8.0' SAMPLE. | | |
| E | No recovery. Drilled | with center bit. | |
| Ē | | | |
| <u> </u> | 8.0-9.5' SAMPLE. Recovered 1.2/1.5'=80 | 104 | 1 |
| Ē | : / . | EL: moderate brown | |
| 巨 | | brown (5 YR 6/4); | |
| | | cobbles from 0.5 to | |
| 30 E | | phi; poorly sorted; | • |
| 30 = | | ular and subangular | 1 |
| | sand and gravel; slightly calcareous; s | weakly cemented; | |
| 1 | T T stightly calculeous, si | inguity moist. | f |
| + | + + 9.5-10.0' SAMPLE. | | |
| | No recovery. Drilled | with center bit. | 1 |
| † | † † | | |
| 1 | 10.0-12.0' SAMPLE. | | |
| [| T Recovered 2.0/2.0' = 1 | | |
| 35 | SAND AND GRAV | EL: same as above, | |
| | 1 1 moist. | | |
| T | 1 12.0-14.0' SAMPLE. | | |
| . | Recovered $1.15/2.0'$ = | | |
| | SAND AND GRAV | | |
| + | + with fewer gravels | moist to slightly | 1 |
| | moist. | | |
| 1 | $T \cdot T$ | | j |

Page 2 01 4

| Lecation Rocky Flats Plant; Mound Ar Coordinates N 36424.92 E 23200.70 Total Depth 30.30' Drilling Company Boyles Bros Date Drilled September 9, 1987 Drilling Method Hollow Stem Auger Logged By R.T. Treat Geologist | |
|---|--|
| Litholo | gic Description Samples Collected or Other Tests Performe |
| 5/6); scattered g angular to subropoorly sorted; sli 16.0-18.0' SAMPL Recovered 0.8/2.0 SAND AND GI slightly moist. 18.0-19.3' SAMPL Recovered 1.3/1.0 CLAYEY SAND yellowish brown brown (5 YR 6/6 up to 5.5mm; p subrounded; wea 19.3-20.3' SAMPL Recovered 1.0/1.0 CLAYEY SAND above; moist to s 20.3-22.3' SAMPL Recovered 0.95/2 SAND AND GRAYR 7/4); sand 3. els up to 4.5m | O' = 45%. AVEL: light brown (5 YR ravels up to 7.0mm; subounded; sand 2.0-1.5 phi; ghtly moist. E. O' = 40%. RAVEL: same as above; E. 1 (10 YR 6/2) to light (5); sand 2.0-1.5 phi; gravel (10 yr 6/2) to light (10 y |

| Coordinates N 36424 Total Depth 30.30' Drilling Company Boy Date Drilled September Drilling Method Holle Logged By R.T. Tree | vles Bros er 9, 1987 w Stem Auger | static R. Sharp Iper S. Bradfie Non Ocked By | 5965.56 None 5951.20' (12/01/87) |
|---|--|---|--|
| | Lithologic Description |)n /01 | amples Collected er her Tests Performed |
| | 22.3-24.3' SAMPLE. Recovered 1.3/2.0' = 65%. CLAYEY SAND AND GRAVE above with finer grained sammist. 24.3-26.3' SAMPLE. Recovered 1.6/2.0' = 80%. 24.3-25.0': SAND AND GRA brown (5 YR 5/2); fine-grascattered gravels up to 1.5m moist. ARAPAHOE FORMATI | VEL: pale ined sand; m; slightly | |
| | 25.0-26.3': SANDY CLAYSTO yellowish orange (10 YR 6/6); very sandy; FeO staining; mois 26.3-28.3' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: pale yellowish YR 8/6) to dark yellowish orange 6/6); some sand; moderately concemented; massive; severe Femoist. | weathered; t. orange (10 nge (10 YR nsolidated; | |
| | 28.3-30.3' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: medium gray (N sive; FeO stained; moist. TOTAL DEPTH: 30.30' | 5/0); mas- | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Mound Area

17-87 Well No.

Casing Diameter

Coordinates N 36424.92 E 23200.70

5967.56' Elevation: Ground Surface

Total Depth: Well 25.75'

5969.53' Top of Casing _

Borehole 32.30'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, type 316 TFJ stainless steel

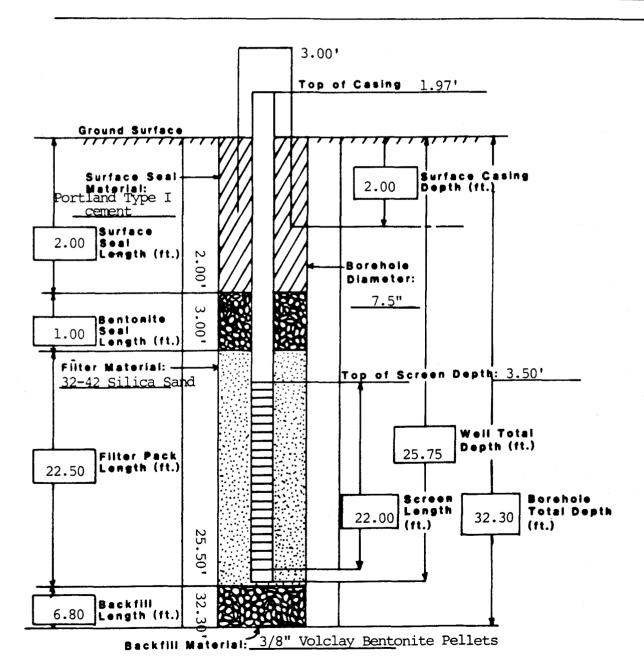
Surface Casing Diameter

Screen Material 0.010" wire wrap, type TFJ stainless steel Date installed Sept. 10, 1987

Approved By

installed By R.T. Treat Geologist

Comments _Centralizer from 15.50' to 16.65'.



PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) NETHOD OF COOPER, BREDEHDEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3.NO.1 OF WAR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AM INSTANTAMEDUS CHARGE OF MATER")
- (2) METHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF MRR ENTITLED

 "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS
 WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 17-87

IMPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DRILLED HOLE = 7.50 INCHES
ESTIMATED POROSITY OF GRAVEL PACK = .25

LENGTH OF SCREEN OR INTAKE PORTION = 7.15 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 7.15 FEET
THICKNESS OF SATURATED AQUIFER ZOME = 7.15 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING, "0" IF RISING)

MUMBER OF HEAD-TIME DATA POINTS = 41

| TIME | HEAD |
|---------|--------|
| (sec) | (FEET) |
| 1.00 | / 40 |
| 1.00 | .640 |
| 2.00 | . 630 |
| 3.00 | .630 |
| 4.00 | . 630 |
| 5.00 | . 620 |
| 6.00 | . 520 |
| 7.00 | .610 |
| 8.00 | .610 |
| 9.00 | .610 |
| 10.00 | .610 |
| 11.00 | .610 |
| 12.00 | 006. |
| 13.00 | .500 |
| 14.00 | 00ء، |
| 15.00 | . 590 |
| 30.00 | .570 |
| 45.00 | .550 |
| 60.00 | . 540 |
| 75.00 | .530 |
| 90.00 | .520 |
| 105.00 | .510 |
| 120.00 | . 500 |
| 135.00 | . 490 |
| 150.00 | . 480 |
| 165.00 | . 480 |
| 180.00 | . 470 |
| 210.00 | .460 |
| 240.00 | .450 |
| 270,00 | .440 |
| 300.00 | . 430 |
| 360.00 | . 420 |
| 420.00 | .410 |
| 525.00 | . 400 |
| 645.00 | .390 |
| 765.00 | .380 |
| 885.00 | .370 |
| 1005.00 | .370 |
| 1245.00 | .360 |
| 1485.00 | .360 |
| 1725.00 | .350 |
| 2205.00 | .350 |
| 1107.00 | . 270 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

.5535

.5606

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 1.98E-06 FT/sec = 6.02E-05 CM/sec

TRANSMISSIVITY = 1.41E-05 FT++2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 6.81E-07 FT/sec = 2.08E-05 CM/sec

TRANSMISSIVITY = 4.87E-06 FT##2/sec

12/11/87

Water Level Data

for

Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 1787

12/01/87

18.33

5969.53

5951.20

INDEX OF DATA

| Boring | No.: 17-87A | |
|----------|----------------------------------|-------------|
| Comple | ted as well? No | |
| Data in | File | |
| <u> </u> | Log of Borehole | |
| | Well Construction Summaries | |
| | Well Development Summaries | |
| | Hydraulic Conductivity Test Data | |
| | and Results | |
| | Packer Test Data and Results | |
| | Water Level Data | |

| | | Plant: Mound A | cea Boreho | le/Well I | No. <u>17-87A</u> | |
|-------------|---|--------------------------------|--|-----------|-------------------------------------|-----|
| Coordinate | N 35411. | 09 E 23200.36 | Ground | Surface | Elevation 5967.58' | |
| Total Dept | h <u>26.30'</u> | | Water | Level E | ncountered None | |
| | | | | 8 | tetic N/A | |
| Drilling Co | mpany Boy | les Bros | Driller | T. Mer | | |
| | August 6- | | | J. Dun | | |
| | | Stem Auger | | Fluid . | | |
| - | J. B. Be | | | d By | | |
| | | ologist | CHUCK | , | 2 Alte Manager | |
| | | | | | Drint Years | |
| _ | Core barr | el and overshot | rod stuck in hole | e. Rota | ry drill moved on | |
| Comments | hole to t | ry to retrieve. | Abandoned hole: | for now. | | |
| _ | | | | | | |
| /- | . / . / | • / | | | | |
| | | • / Lubal | gic Description | | Samples Collected o | r |
| /04 | | | yic beechpilen | , | Other Tests Perform | • • |
| 0 | 1819-654 | | | | | |
| - | | | <u>TOPSOIL</u> | | HNu Background=0.4 | |
| • | T | 0.0-2.0' SAMPLE | • | | OVA Background=0.0 | |
| • | ↓ . ↓ . ↓ | Recovered 2.0/2 | | | | |
| | | | OIL: moderate bro | wn (5 | | |
| • | † / / | | and clay with abo | | | |
| | | | s; unconsolidated; | | | |
| | | sortea; abundan | t roots and grasses; | ary. | | |
| <u>.5</u> | | ROCKY I | LATS ALLUVIUM | İ | | |
| | | | | 1 | | |
| · | \mathbf{I} | | AND GRAVEL: mo | | | |
| • | † * * * * * * * * * * * * * * * * * * * | | (/4); abundant calid th HCl; abundant o | | | |
| | | | angular; unconsoli | | | |
| • | 1 / 1 | medium-grained | | autou, | | |
| | ↓ | • | - | | | |
| 10 | | 2.0-4.0' SAMPLE | | | | |
| | $I = I \nearrow I$ | Recovered 2.0/2. | GRAVEL: pale yel | lowish | | |
| • | ↓ | | 5/2); very fine-grain | | | |
| _ | | | nd; abundant qu | | | |
| • | | | ; abundant caliche | | | |
| • | , | strongly with His sorted; dry. | Cl; unconsolidated; | poorly | | |
| | | sortou, ury. | | | | |
| • | † | 4.0-4.5' SAMPLE | - | - 1 | | |
| <u>15</u> | ↓ | Recovered 0.4/0. | | | | |
| | | SAND AND G. dry. | RAVEL: same as | above; | | |
| • | | ury. | | | ` | |
| - | ∤ | - <u>4.5-5.5' SAMPL</u> | E. No recovery. I | Orilled | | |
| | | with center bit. | - - | | 20 0's B and in an in | |
| - | 物学プラ | • | | į | 20.0': Readings in well head: HNu = | |
| | | • | | | 0.8; OVA = 0.6. | |
| 20 | | | | Ì | | |
| <u> </u> | 1 1 | | | | | |

| | | e/Well No. 17-87A Surface Elevation 5967.58' |
|--------------|---|---|
| | | evel Encountered None |
| Total Depti | 7 20.30 Water L | Static N/A |
| Drilling Con | mpany Boyles Bros Driller | T. Merritt |
| Date Drille | d August 6-7, 1987 Helper | J. Duncan |
| Drilling Met | | Fluid None |
| | J. B. Bergman Checke | . V.1\D . /// |
| | Geologist | Site Manager |
| Comments | Core barrel and overshot rod stuck in hole hole to try to retrieve. Abandoned hole for | . Rotary drill moved on or now. |
| 20 | Lithologic Description | Samples Collected or Other Tests Performed |
| <u>30</u> | 5.5-6.0' SAMPLE. Recovered 0.5/0.5' = 100%. SAND AND GRAVEL: pale yell brown (10 YR 6/2); very fine-grand; quartzite gravels; poorly sorte consolidated; dry. Readjust depth after hole caved 1.2'. 4.8-6.8' SAMPLE. Recovered 2.0/2.0' = 100%. SAND AND GRAVEL: grayish or pink (5 YR 7/2) sand matrix with dant quartzite gravels; poorly sorter consolidated; angular to subrounded fine-grained sand; abundant calic acts strongly with HCl; dry. 6.8-9.8' SAMPLE. Recovered 2.0/3.0' = 67%. SAND AND GRAVEL: pale yell brown (10 YR 6/2) sand matrix; abundant calic gravels and pebbles; provided; unconsolidated; angular to rounded; very fine-grained sand; dant caliche-reacts strongly with dry. 9.8-11.8' SAMPLE. No recovery. 11.8-13.8' SAMPLE. No recovery. | rained d; un- orange abun- d; un- ; very he-re- lowish andant poorly sub- abun- |
| | | |

| untered None le N/A t |
|---|
| Site Manager CEARP Manager drill moved on |
| Samples Collected or Other Tests Performed |
| |
| |
| |
| t = = : |

INDEX OF DATA

| Boring | No.: 18-87BR |
|----------|----------------------------------|
| Comple | eted as well? Yes |
| Data ir | n File |
| X_ | Log of Borehole |
| <u> </u> | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| <u> </u> | Packer Test Data |
| X | Water Level Data |

Location Rocky Flats Plant: Mound Area Borehole/Well No. ___18-87BR N 36413.74 E 23231.24 Ground Surface Elevation _ 5967.38' Coordinates 148.00' Vater Level Encountered 16.8' Total Depth Static 5939.13' (12/01/87) T. High; P. Bushkovski Drilling Company Boyles Bros Date Drilled August 5-6,: August 18-20, 1987 Helper R. Sharp; K. Parker None: 0.0 - 54.0' Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid Water: 54.0 - 148.0' L.A. Gregory-Frost; K.D. Holliway Checked By SILO Manager Geologist for3 CEARP Manager Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Comments Samples Collected or Lithologic Description **TOPSOIL** HNu Background=0.4 OVA Background=0.2 No readings over 0.0-2.0' SAMPLE. background. Recovered 1.8/2.0' = 90%. 0.0-0.4': SANDY TOPSOIL: moderate brown (5 YR 3/4); rooted; grasses; occasional subangular quartzite pebbles; slightly calcareous; unconsolidated; dry. 0.4-1.8': GRAVELLY TOPSOIL: grayish brown (5 YR 3/2); sandy gravel; quartzite pebbles and cobbles; angular to subangular; up to 0.25' diameter; calcareous; unconsolidated; dry. **ROCKY FLATS ALLUVIUM** 1.8-2.0': SAND: dark yellowish brown (10 YR 4/2); fine to medium-grained sand; 10 subangular to rounded; moderately sorted; quartzite pebbles; subangular; caliche deposits; very calcareous; unconsolidated; drv. 2.0-4.0' SAMPLE. Recovered 1.9/2.0' = 95%. 2.0-2.6': SAND: moderate yellowish brown 0 (10 YR 5/4) to grayish orange (10 YR 7/4); very fine to fine-grained; rounded; <u>15</u> well sorted; clayey; occasional subangular quartzite pebbles and cobbles; caliche deposits; very calcareous; consolidated; dry. 20

Location Rocky Flats Plant: Mound Area Borehole/Well No. ___18-87BR Coordinates N 36413.74 E 23231.24 Ground Surface Elevation 5967.38' Total Depth 148.00' Water Level Encountered 16.8' Static 5939 13' (12/01/87) Drilling Company Boyles Bros Driller T. High: P. Bushkovski Date Drilled August 5-6; August 18-20, 1987 Helper R. Sharp; K. Parker Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid None: 0.0 - 54.0' Water: 54.0 - 148.0' Logged By L.A. Gregory-Frost; K.D. Holliway Checked By Geologist Site Manager CEARP Manager Comments Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Samples Collected or Lithologic Description Other Tests Performed 2.6-4.0': SANDY GRAVEL: moderate yel-127.00-136.85": lowish brown (10 YR 5/4) to grayish or-Packer Test Interval ange (10 YR 7/4); medium to coarse-#3. grained sand; rounded to subangular; well 000 133.20-142.85": sorted; quartzite pebbles and cobbles; :00 Packer Test Interval subangular to angular; caliche deposits 0.0 000 crystalline and chalky; very calcareous; #1. unconsolidated; dry. 4.0-7.7' SAMPLE. Recovered 2.0/3.7'=54%. GRAVEL: moderate yellowish brown (10 YR 5/4) to grayish orange (10 YR 7/4); medium to very coarse-grained; sandy; poorly sorted; subangular; unconsolidated with occasional clayey consolidated zones; granite and quartzite pebbles and cobbles; subangular to angular; very calcareous; 30 caliche deposits; dry. 7.7-10.2' SAMPLE. No recovery. 10.2-12.7' SAMPLE. No recovery. 12.7-15.2' SAMPLE. No recovery. Cuttings and rig response indicate drilling in gravel with cobbles. 35 40

Location Rocky Flats Plant: Mound Area Borehole/Well No. ___18-87BR Coordinates N 36413.74 E 23231.24 Ground Surface Elevation _ 5967.38' Total Depth 148.00' Water Level Encountered 16.8' **Static** 5939.13' (12/01/87) Driller T. High; P. Bushkovski Drilling Company Boyles Bros Date Drilled August 5-6; August 18-20, 1987 Helper R. Sharp; K. Parker None: 0.0 - 54.0' Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid Water: 54.0 - 148.0 Logged By L.A. Gregory-Frost; K.D. Holliway Checked By Site Manager Geologist CEARP Manager Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Comments Samples Collected or Lithologic Description Other Tests Performed 15.2-17.7' SAMPLE. Recovered 0.9/2.5' = 36%. 16.6-17.7': SAND: moderate yellowish brown (10 YR 5/4) to moderate brown (5 YR 4/4); medium to very coarse-grained; predominantly very coarse-grained; subangular; poorly sorted; abundant quartzite and granite pebbles and cobbles; subangular to rounded; slightly clayey; uncon-<u>45</u> solidated, loose grains; moist to saturated. 17.7-20.2' SAMPLE. Recovered 0.6/2.5 = 24%. SANDY GRAVEL: moderate yellowish brown (10 YR 5/4); quartzite and granite pebbles and cobbles; subangular; very sandy; very coarse-grained; rounded to subangular; well sorted; unconsolidated; 50 saturated. 53.85-63.00': Packer 20.2-22.7' SAMPLE. Test Interval #12. Recovered 1.9/2.5' = 76%. GRAVEL: moderate yellowish brown (10 YR 5/4); quartzite and granite pebbles and cobbles; rounded to subangular; fine to very coarse-grained; sandy; angular to rounded; poorly sorted; slightly clayey; unconsolidated; saturated. 55 22.7-25.2' SAMPLE. No recovery. ARAPAHOE FORMATION 24.6-25.2': CLAYSTONE: base 0.6' of sample tube coated with clay.

Location Rocky Flats Plant: Mound Area Borehole/Well No. ___18-87BR Coordinates N 36413.74 E 23231.24 Ground Surface Elevation _5967.381 Total Depth __148.00' Water Level Encountered 16.8' Static 5939.13' (12/01/87) Driller T. High; P. Bushkovski Drilling Company Boyles Bros Date Drilled August 5-6; August 18-20, 1987 Helper R. Sharp; K. Parker Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid None: 0.0 - 54.0' Logged By L.A. Gregory-Frost; K.D. Holliway Checked By Water: 54.0 - 148.0' Site Manager Geologist CEARP Manager Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Comments .4.50 Samples Collected or Lithologic Description Other Tests Performed 25.2-27.7' SAMPLE. No recovery. CLAYSTONE: on outside of sample tube. 27.7-30.2' SAMPLE. No recovery. 63.00-72.65': Packer Test Interval #11. 30.2-32.7' SAMPLE. No recovery. 32.7-35.2' SAMPLE. Recovered 1.7/2.5' = 68%. <u>65</u> CLAYSTONE: light olive gray (5 Y 5/2); silty; occasional fractures; occasional moderate yellowish brown (10 YR 5/4) mottling; carbonaceous debris; consolidated; weathered; dry to moist. 35.2-37.7' SAMPLE. Recovered 2.2/2.5' = 88%. CLAYSTONE: same as above; dry to <u>70</u> moist. 73.47-83.12': Packer 37.7-40.2' SAMPLE. Test Interval #10. Recovered 2.5/2.5' = 100%. CLAYSTONE: light olive gray (5 Y 5/2); silty; occasional fractures-dark yellowish orange (10 YR 6/6); occasional carbonaceous debris; rare carbonized plant leaf casts on bedding planes; consolidated; weathered; moist.

| Coordinates N 36 Total Depth 148. Drilling Company Date Drilled Augu Drilling Method Ho | | Ground Surfec Water Level 1 Driller T. Hi Helper R. Sh Drilling Fluid | No. 18-87BR • Elevation 5967.38' Encountered 16.8' Static 5939.13' (12/01/87) gh; P. Bushkovski arp; K. Parker None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager |
|--|---|---|--|
| Comments Surfa | ace casing set to 52.7' Augus | t 10, 1987 by I | |
| 80 | Lithologic Desci | ription | Samples Collected or Other Tests Performed |
| 85 | 40.2-42.7' SAMPLE. Recovered 3.0/2.5 = 120%. 40.2-42.3': CLAYSTONE: 1 (5 Y 5/2) and moderate y (10 YR 5/4); silty; trace versand at base; weathered; m 42.3-42.7': CLAYSTONE: 3/0) with moderate yellow YR 5/4) and dark yellow YR 6/6) along fractures; fine-grained sand; weather | rellowish brown ery fine-grained hoist. dark gray (N wish brown (10 vish orange (10 silty; trace very | 83.15-92.86': Packer Test Interval #9. |
| 90 | 42.7-45.2' SAMPLE. Recovery 2.5/2.5' = 100%. 42.7-44.7': CLAYSTONE: 3/0) with moderate yellor YR 5/4) mottling; abundant debris; abundant coalifies silty; consolidated; weather 44.7-45.2': CLAYSTONE: main is brown (10 YR 5/4) and N 2/0); hard; coal lenses; fied plant material; brokes | wish brown (10 nt carbonaceous d plant debris; red; moist. noderate yellow-d grayish black abundant coalinup; light olive | 86.40-96.05': Packer Test Interval #8. 88.40-98.05': Packer Test Interval #7. |
| 95 | gray (5 Y 6/1) rooted claweathered; dry to moist. 45.2-47.7' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: dark gray dark yellowish orange (10 fractures; silty; trace ver grained sand; consolidation moist. | (N 3/0) with YR 6/6) along y fine to fine- | |
| 100 | | | 98.05-107.70': Packer Test Interval #6. |

| · · · · · · · · · · · · · · · · · · · | <u>N 36413.74 E 23231.24</u> | Ground Surfac | No. <u>18-87BR</u> • Elevation <u>5967.38'</u> Encountered <u>16.8'</u> Static <u>5939.13'</u> (12/01/87 |
|---------------------------------------|--|--|--|
| Date Drilled Drilling Method | August 5-6; August 18-20, 1987 Hollow Stem Auger: Rotary Core L.A. Gregory-Frost; K.D. Holliway Geologisi | Driller T. H. Helper R. St Drilling Fluid | igh: P. Bushkovski harp: K. Parker None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager |
| | Surface casing set to 52.7' Augus | t 10, 1987 by | |
| 100 | 47.7-50.2' SAMPLE. Recovered 2.5/2.5' = 100%. | | Other Tests Performed |
| 105 | 47.7-48.5': CLAYSTONE: (45.2-47.7'); moist. 48.5-50.2': CLAYSTONE: 3/0); silty; trace very fin calcareous deposits along solidated; unweathered; mo 50.2-52.7' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as abmoist. | dark gray (N e-grained sand; fractures; con- ist. | 107.70-117.35': Packer Test Interval #5. |
| 110 | 54.0-56.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 1.85/2.0' = 92.5%. CLAYSTONE: olive black silt; some very fine-grained dry. 56.0-58.0' SAMPLE. | | |
| 115 | Recovered 0.6/2.0' = 30%. RQD = 0.0/0.6' = 0%. 56.0-57.3': CLAYSTONE: of 2/1); some silt; some sand; sils; dry. 58.0-60.0' SAMPLE. Recovered 2.7/2.0' = 135%. RQD = 1.19/2.7' = 44%. 57.3-58.0': CLAYSTONE: from previous run; same as 58.0-60.0': CLAYSTONE: of 58.0-60.0': CLA | recovered core 56.0-57.3'; dry. | 117.35-127.00': Packer Test Interval |
| 120 | 2/1); some silt; trace sand; | | #4. |

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Borehole/Well No. ___18-87BR Location Rocky Flats Plant: Mound Area N 36413.74 E 23231.24 Ground Surface Elevation _ 5967.38' Coordinates 148,00' Water Level Encountered 16.8' Total Depth Static 5939.13' (12/01/87) Driller T. High: P. Bushkovski Drilling Company Boyles Bros Helper R. Sharp; K. Parker Date Drilled August 5-6; August 18-20, 1987 None: 0.0 - 54.0' Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid Water: 54.0 - 148.0'\

\text{\text{\$\lambda}} L.A. Gregory-Frost; K.D. Holliway Checked By Site Manager Geologist CEARP Manager Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Comments Samples Collected or Lithologic Description 1204 60.0-65.0' SAMPLE. Recovered 4.25/5.0' = 85%. RQD = 2.25/4.25' = 53%.60.0-61.45': CLAYSTONE: greenish black (5 GY 2/1) to olive black (5 Y 2/1); trace 123.55-133.20": silt; brittle; damp. Packer Test Interval 61.45-64.25': CLAYSTONE: olive black (5 #2. Y 2/1) to dark gray (N 3/0); trace sand; 125 damp. 65.0-69.0' SAMPLE. Recovered $2.4/4.0^{\circ} = 60\%$. RQD = 1.30/2.4' = 54%. CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); some silt; trace sand; trace plant fossils; damp. 69.0-73.0' SAMPLE. <u>130</u> Recovered 3.0/4.0' = 75%. RQD = 0.0/3.0' = 0%. 69.0-69.6': CLAYSTONE: same as above; damp. 69.6-73.0': CLAYEY SILTSTONE: dark greenish gray (5 GY 4/1) to dark gray (N 3/0); some silt; some clay; some sand, 2.0-3.0 phi; fairly well cemented; fairly well sorted; damp. 135 140

| Coordinates N 36413.74 E 23231.24 Total Depth 148.00' Drilling Company Boyles Bros Date Drilled August 5-6; August 18-20, 1987 Drilling Method Hollow Stem Auger: Rotary Core Legged By L.A. Gregory-Frost; K.D. Holliway Geologist | Checked By None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager CEARP Manager |
|--|--|
| Surface casing set to 52.7" August | Samples Collected or |
| 73.0-77.0' SAMPLE. Recovered 2.2/4.0' = 55%. RQD = 0.90/2.2' = 68.2%. 73.0-74.35': CLAYEY medium gray (N 5/0) to gray (N 4/0); some clay; sa well sorted; poorly cemented 74.35-75.20': SANDY SI STONE: medium gray (N 5 dark gray (N 4/0); some ver sand; some silt; some plant for 77.0-79.0' SAMPLE. Recovered 2.6/2.0' = 130%. RQD = 1.13/2.6' = 43.1%. 75.20-76.0': CLAYSTONE: covered from previous run; 75.20'. 77.0-77.9': SILTY CLAYSTO (N 3/0) to olive black (5 Y damp. 77.9-79.0': CLAYEY SILTY gray (N 3/0) to olive black very fine-grained, 8.5-4.0 pl fossils; slightly damp. 79.0-81.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 1.6/2.0' = 80%. SILTY CLAYSTONE: olive | medium dark and 2.0-3.0 phi d; damp. LTY CLAY- /0) to medium ry fine-grained fossils; damp. silty core re- same as 74.35- ONE: dark gray 2/1); some silt; SAND: dark ck (5 Y 2/1); hi; trace plant e black (5 Y |
| 2/1); some silt; trace very sand; some plant fossils; slig | |

| Coordinates N 36413.74 E 23231.24 Total Depth 148.00' Drilling Company Boyles Bros Date Drilled August 5-6; August 18-20, 1987 Drilling Method Hollow Stem Auger: Rotary Core Logged By L.A. Gregory-Frost; K.D. Holliway Geologist Comments Surface casing set to 52.7' August | Checked By None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager CEARP Manager |
|--|--|
| Lithologic Descr | Samples Collected or Other Tests Performed |
| 81.0-85.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 2.85/4.0' = 71.3%. 81.0-84.4': SILTY CLAY greenish gray (5 GY 4/1) to Y 2/1); some silt; trace fin some plant fossils; damp. 84.4-85.0': CLAYSTONE: gray (N 4/0); moist. 85.0-88.0' SAMPLE. Recovered 0.8/3.0' = 27%. RQD = 0.47/0.80' = 50%. SILTY CLAYSTONE: dark some silt; damp to moist. | o olive black (5 ne-grained sand; medium dark |
| 88.0-90.0' SAMPLE. Recovered 0.8/2.0' = 40%. RQD = 0.0/0.8' = 0%. CLAYSTONE: olive black (silt; moist. | (5 Y 2/1); trace |
| 90.0-92.0' SAMPLE. Recovered 1.9/2.0' = 95%. RQD = 1.81/1.9' = 95%. SILTY CLAYSTONE: oliv 2/1) to dark gray (N 3/0); very fine-grained sand; of fossils; dry. 92.0-94.0' SAMPLE. Recovered 2.2/2.0' = 110%. RQD = 1.8/2.2' = 81.8%. SILTY CLAYSTONE: same | some silt; some ccasional plant |

| Driffing Method Hollow S Logged By L.A. Gregor Geole | E 23231.24 Bros August 18-20, 1987 Stem Auger: Rotary Core Ty-Frost; K.D. Holliway | Ground Surfa Water Level Driller T. Helper R. S Drilling Fluid Checked By | None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager |
|--|--|--|---|
| | Lithologic Descr | iption | Samples Collected or Other Tests Performed |
| | 24.0-97.0' SAMPLE. Recovered 1.3/3.0' = 43.3%. RQD = 0.0/1.3' = 0.0%. SILTY CLAYSTONE: same 27.0-99.0' SAMPLE. Recovered 3.0/2.0' = 150%. RQD = 0.0/3.0' = 0.0%. SILTY CLAYSTONE: same 29.0-101.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 1.0/2.0' = 50%. SILTY CLAYSTONE: olive 2/1) to dark gray (N 3/0); very fine-grained sand; offossils; small stringers 100.00-100.25'; dry. 101.0-104.0' SAMPLE. Recovered 1.3/3.0' = 43%. RQD = 0.0/1.3' = 0.0%. SILTY CLAYSTONE: same cept no coal; dry. 104.0-107.0' SAMPLE. Recovered 3.75/3.0' = 125%. RQD = 3.27/3.75' = 87.2%. SILTY CLAYSTONE: same cept no coal; dry. | we black (5 Y some silt; some ccasional plant of coal from e as above; exercise as above; recone (same de- | |

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Location Rocky Flats Plant: Mound Area Borehole/Well No. ___18-87BR Coordinates N 36413.74 E 23231.24 Elevation 5967.38' Total Depth 148.00' Water Level Encountered 16.8' **Static** 5939.13' (12/01/87) Driller T. High: P. Bushkovski Drilling Company Boyles Bros Date Drilled August 5-6; August 18-20, 1987 Helper R. Sharp; K. Parker Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid _ None: 0.0 - 54.0' Water: 54.0 - 148.0 Logged By L.A. Gregory-Frost; K.D. Holliway Checked By _ Site Manager Geologist CEARP Manager Comments Surface casing set to 52.7' August 10, 1987 by L.A. Gregory-Frost Samples Collected or Lithologic Description 107.0-110.0' SAMPLE. Recovered 2.8/3.0' = 93.3%. RQD = 0.45/2.8' = 16%.107.0-109.15': SILTY CLAYSTONE: same as above: dry. 109.15-109.80': CLAYEY SANDSTONE: very light gray (N 8/0) to dark gray (N 3/0); sand 3.0-4.0 phi, subrounded; well cemented; calcareous; dry. 110.0-111.0' SAMPLE. Recovered 1.0/1.0' = 100%. RQD = 0.0/1.0' = 0.0%.SANDSTONE: very light gray (N 8/0) to medium dark gray (N 4/0); very finegrained; well cemented, calcareous cementation; some plant fossils; some cross bedding; dry. 111.0-115.0' SAMPLE. Recovered 2.4/4.0' = 60%. RQD = 0.0/2.4' = 0.0%.111.0-112.0': CLAYSTONE AND SAND-STONE: same as above; except have a quartzite rock at 111.20; dry. 112.0-113.15': SANDSTONE: medium gray (N 5/0) to medium dark gray (N 4/0); sand 3.5-2.5 phi, fairly well sorted; subangular to subrounded; some clay; some lamination; damp. 113.15-113.40': SILTY CLAYSTONE: dark gray (N 3/0); some silt; fairly well cemented; dry.

| Location Rocky Flats Plant: Mound Area | Borehole/Well No. 18-87BR |
|---|-----------------------------------|
| Coordinates N 36413.74 E 23231.24 | Ground Surface Elevation 5967.38' |
| Total Depth 148.00' | Water Level Encountered 16.8' |
| | Static 5939.13' (12/01/87) |
| Orilling Company Boyles Bros | Driller T. High; P. Bushkovski |
| Date Drilled August 5-6; August 18-20, 1987 | Helper R. Sharp; K. Parker |
| Drilling Method Hollow Stem Auger: Rotary Core | Drilling Fluid None: 0.0 - 54.0' |
| Logged By L.A. Gregory-Frost; K.D. Holliway | Water: 54.0 - 148.0' |
| Geologist | Site Manager |
| | CEARP Manager |
| Comments Surface casing set to 52.7' Augus | st 10, 1987 by L.A. Gregory-Frost |
| | |
| | |
| | Samples Collected or |
| Lithologic Desc | ription Other Tests Performed |
| | |
| 115.0-117.0' SAMPLE. | |
| Recovered $0.9/2.0^{\circ} = 45\%$. | |
| RQD = 0.0/2.0' = 0.0%. | |
| CLAYEY SANDSTONE: | |
| except sand 3.0-3.5 phi; sr damp. | mail clay lenses; |
| damp. | · |
| † † 117.0-119.0' SAMPLE. | · |
| Recovered 1.3/2.0' = 65%. | |
| $ \begin{bmatrix} & & & & & & & & & & & & \\ & & & & & &$ | VSTONE: dark |
| gray (N 3/0); fairly well c | |
| 118.15-118.30': SANDST | |
| gray (N 5/0) to medium 4/0); sand 3.0-4.0 phi, fai | |
| some cementation; damp. | |
| + + + | |
| _ 119.0-121.5' SAMPLE. | |
| Recovered $4.25/2.5^{\circ} = 170\%$ | |
| $\downarrow RQD = 3.55/4.25' = 83.5\%.$ | |
| SILTY CLAYSTONE: olive 2/1) to dark gray (N 3/0); | |
| of silty claystone and s | |
| from previous run; some | sand in lenses; |
| slightly damp to dry. | |
| T T 121.5-124.0' SAMPLE. | |
| Recovered $2.8/2.5' = 112\%$. | |
| | |
| SILTY CLAYSTONE: same terbedded sandstone; 3.0-4 | |
| well cemented; occasional | |
| slightly damp to dry. | , |
| TTT | |
| + + + | |
| | |

| Coordinates Total Depth Drilling Com Date Drilled Drilling Meti | N 36413.74 E 23231.24 148.00' Boyles Bros August 5-6; August 18-20, 1987 Hollow Stem Auger: Rotary Cor L.A. Gregory-Frost; K.D. Holliwa | Water Level E Briller T. Hic Helper R. Sha Te Drilling Fluid | ## Elevation |
|---|---|---|--|
| Comments | Surface casing set to 52.7' Augu | | Semples Collected or Other Tests Performed |
| | 124.0-127.0' SAMPLE. Recovered 3.0/3.0' = 100% RQD = 2.78/3.0' = 93%. SILTY CLAYSTONE: s damp to dry. 127.0-131.0' SAMPLE. Recovered 4.0/4.0' = 100% RQD = 3.40/4.0' = 85%. CLAYEY SANDSTONE: 7/0) to olive black (5 Y 2) phi, fairly well sorted, so some clay in matrix and occasional plant fossils; s dry. | light gray (N 2/1); sand 2.0-3.0 ome cementation; lenses; trace silt; | |
| _ | 131.0-135.0' SAMPLE. Recovered 4.0/4.0' = 100% RQD = 4.00/4.00' = 100% 131.0-133.20': CLAYEY same as above; slightly da 133.20-135.0': SILTY CLA black (5 Y 2/1) some grained sand; occasional p | SANDSTONE: mp to dry. AYSTONE: olive silt; trace fine- | |
| - + + + + + + + + + + + + + + + + + + + | 135.0-139.0' SAMPLE. Recovered 3.95/4.0' = 99% RQD = 3.7/3.95' = 93.7%. SILTY CLAYSTONE: sam 139.0-143.0' SAMPLE. Recovered 3.7/4.0' = 93%. RQD = 3.36/3.7' = 91%. 139.0-140.1': SILTY CLA' as above. 140.1-143.7': CLAYSTONE Y 2/1); trace silt; trace pi | YSTONE: same E: olive black (5 | |

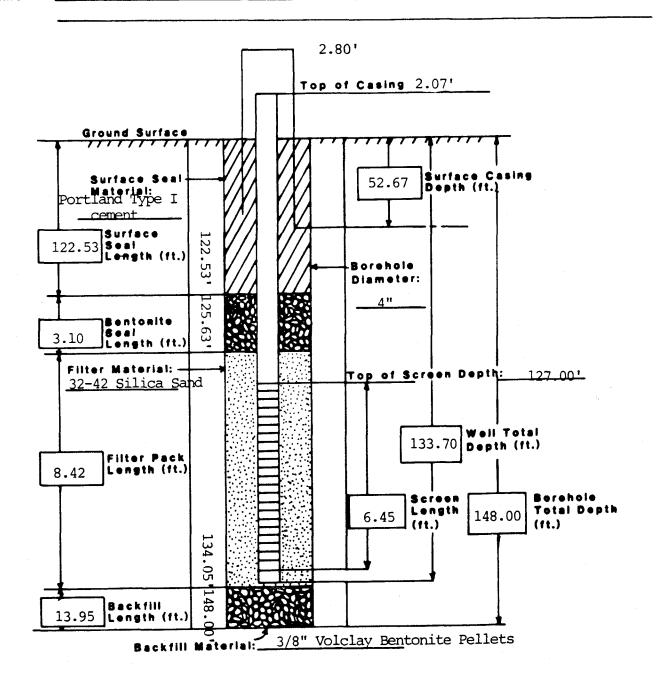
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| Coordinates N 364 Total Depth 148.00 Drilling Company B Date Drilled Augus Drilling Method Holl Logged By L.A. G | 1 | Ground Surfac Water Level I Driller T. Hi Helper R. Sh Drilling Fluid Checked By | Static 5939.13' (12/01/8') ch ; P. Bushkovski arp ; K. Parker None: 0.0 - 54.0' Water: 54.0 - 148.0' Site Manager | 7) |
|--|--|--|--|-------|
| | Lithologic Desc | ription | Samples Collected or Other Tests Performed | d |
| | 143.0-147.0' SAMPLE. Recovered 0.2/4.0' = 50%. RQD = 0.0/4.0' = 0%. CLAYSTONE: same as ab 147.0-148.0' SAMPLE. Recovered 2.7/4.0' = 67.59 RQD = 0.8/2.70' = 29.6%. CLAYSTONE: same as a 1.70' of claystone core (s from previous run; damp. TOTAL DEPTH: 148.00' | ove. 6. above; recovered ame description) | | |
| | | | | |
| | | | | |

WELL COMPLETION INFORMATION

18-87BR Location Rocky Flats Plant; Nound Area Well No. Elevation: Ground Surface 5967.38 ' Coordinates N 36413.74 E 23231.24 Top of Casing ___ 5969.45 Total Depth: Well 133.70' Borehole __ 148.00' Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter type 316 TFJ stainless steel Screen Material ()_010" wire wrap Surface Casing Diameter Date installed Aug. 25, 1987 Approved By 🕓 Installed By J.B. Bergman Geologist 7ems ZEARP Manager

Comments Surface casing set to 52.67' by L.A. Gregory-Frost on August 13, 1987



Packer test data for well 18-87BR are presented on the following table. However, the well was still in development on December 1, 1987, and static water levels could not be measured. Hydraulic conductivity values were thus not calculated.

| | | | | PACKER | TEST | DATA SH | SHEET | | | | |
|-----------------|--------------------------------|----------------------------|--------------------------|------------------|-------------|---------------------------------|---|--------|---------------------|----------------------|-----------|
| Job No.: | Job No.: 2029-17-02 | | | | | | | | Static Water Level: | ter Level: _ | |
| Location: Rocky | Rocky Flats | s Plant: | Mound Area | | | | | | Date of W | Date of Water Level: | |
| Well No: | 18-87BR | ~ | | | | | | | Page | 01.2 | |
| Borehole | Borehole Diameter: | 0.333' | | °5 | Comments:_ | | | | | | |
| Acrylic Tu | Acrylic Tube Diameter: 0.1663' | vr. 0.1663' | | | 1 1 | | | | | | |
| Test Interval | Top of Teet Interval | Bottom of Teet Interval | Test Length (minutes) | Gage Preseure | Gege Height | Avg. H ₂ O Height | Gage Height +Avg. H ₂ O Height | Δħ | Date of Test | Libratogy | Geologist |
| 1 | 135.20 | 142.85 | 15 | 0 | 5.50' | 4.13 | 9.63' | 0.73 | 8/21/87 | KCL | KDH |
| | | | 15 | 32.4 | 5.50' | N/A | N/A | 0.135 | 8/21/87 | KCL | KDH |
| | | | 15 | 0 | 5.50' | ľ | 1 | -0.07 | 8/21/87 | KCL | KDH |
| 2 | 123,55 | 133.20 | 15 | 0 | 5.50 | 1 | | -0.02 | 8/21/87 | Kass | KDH |
| | | | 15 | 30.0 | 5.50 | N/A | N/A | 0.08 | 8/21/87 | Kass | KDH |
| | | | 15 | 0 | 5.50 | - | • | -0.065 | 8/21/87 | Kass | KDH |
| 3 | 127.00 | 136.65 | 15 | 0 | 5.50 | 1 | - | -0.07 | 8/21/87 | Kass | KDH |
| | | | 15 | 30.90 | 5.50 | N/A | N/A | 0.38 | 8/21/87 | Kass | KDH |
| | | | 15 | 0 | 5.50 | 1 | | -0.051 | 8/21/87 | Kass | KDH |
| 4 | 117.35 | 127.00 | 15 | 0 | 5.50 | 1 | - | -0.07 | 8/21/87 | KCL | KDH |
| | | | 15 | 28.48 | 5.50 | N/A | N/A | 0.11 | 8/21/87 | KCL | KDH |
| | | | 15 | 0 | 5.50 | ı | 1 | -0.04 | 8/21/87 | KCL | KDH |
| 5 | 107.70 | 117.35 | 15 | 0 | 5.50 | 4.72 | 10.22 | 0.56 | 8/21/87 | KCL | KDH |
| | | • | 15 | 26.64 | 5.50 | N/A | N/A | 1.22 | 8/21/87 | KCL | KDH |
| | | | 15 | 0 | 5.50 | 4.64 | 10.14 | 0.52 | 8/21/87 | KCL | KDH |
| 9 | 98.05 | 107.70 | 15 | 0 | 5.50 | 4.66 | 10.16 | 0.47 | 8/21/87 | KCL | KDH |
| | | | 15 | 24.05 | 5.50 | N/A | N/A | 5.30 | 8/21/87 | KCL | KDH |
| | | | 15 | 0 | 5.50 | 4.38 | 9.88 | 0.210 | 8/21/87 | KCL | KDH |

| | | | | PACKER | TEST | DATA SH | SHEET | | | | |
|----------------------|-------------------------------|---|--------------------------|--------|-------------|---------------------------------|------------------------------------|--------|--------------|-----------------------|-----------|
| Job No.: | 2029-17-02 | 72 | | | | | | | Static Wa | Static Water Level: _ | |
| Location: | Rocky Fla | Location: Rocky Flats Plant; Mound Area | Mound Area | | | | | | Date of M | Date of Water Level: | |
| Well No.: | | 18-87BR (CON'T) | | | | | | | Page 2 | 01 2 | |
| Borehole | Borehole Diameter: | 0.333' | | ვ | Comments: | | | | | | |
| Acrylic Tu | Acrylic Tube Diameter: 0.1663 | or: 0.16631 | | | i I | | | | | | |
| Test Interval No. | Top of Teet Interval | Bottom of Teet Interval | Test Length (minutes) | Goge | Gage Height | Avg. H ₂ O Height | Gage Helght +Avg. H2O Helght | ۵ | Date of Test | Libratogy | Geologiet |
| 7 | 88.40 | 98.05 | 15 | 0 | 5.50 | 4.51 | 10.01 | 0.0 | 8/24/87 | KCL | JBB |
| | | | 15 | 17.92 | 5.50 | | | 1 | 8/24/87 | KCL | JBB |
| | | | 15 | 1 | 5.50 | | | (| 8/24/87 | KCL | JBB |
| 8 | 86.40 | 96.05 | 15 | 0 | 5.50 | 5.53 | 11.03 | 0.505 | 8/24/87 | KCL | JBB |
| | | | 15 | 18.08 | 5.50 | N/A | N/A | • | 8/24/87 | KCL | JBB |
| | | | 15 | 1 | 5.50 | ı | 1 | , | 8/24/87 | KCL | JBB |
| 6 | 83.15 | 92.80 | 15 | 0 | 5.50 | 3.85 | 9.35 | 0.24 | 8/24/87 | KCL | JBB |
| | | | 15 | 18 | 5.50 | N/A | N/A | 2.693 | 8/24/87 | KCL | JBB |
| | | | 15 | 0 | 5.50 | 1 | 1 | -0.192 | 8/24/87 | KCL | JBB |
| 10 | 73.47 | 83.12 | 15 | 0 | 5.50 | 3.68 | 9.18 | 1.238 | 8/24/87 | KCL | LGF |
| | | | 15 | 15 | 5.50 | N/A | N/A | 0.085 | 8/24/87 | KCL | LGF |
| | | | 15 | q | 5.50 | 4.50 | 10.00 | 0.010 | 8/24/87 | KCL | LGF |
| 11 | 63.0 | 72.65 | 15 | 0 | 5.50 | ı | 1 | -1.50 | 8/24/87 | KCL | JBB |
| | | | 15 | 12.5 | 5.50 | N/A | N/A | 0.045 | 8/24/87 | KCL | JBB |
| | | | 15 | 0 | 5.50 | l | Į | ţ | 8/24/87 | KCL | JBB |
| 12 | 53.35 | 63.0 | 15 | 0 | 5.50 | 3.50 | 9.00 | .340 | 8/24/87 | KCL | JBB |
| | | | 15 | 10.25 | 5.50 | N/A | N/A | 2.060 | 8/24/87 | KCL | JBB |
| | | | 15 | 0 | 5.50 | i | ı | l | 8/24/87 | KCL | JBB |
| | | | | | | | | | | | |

12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC TOC (ft) from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 1887BR

12/01/87

30.32

5969.45

5939.13

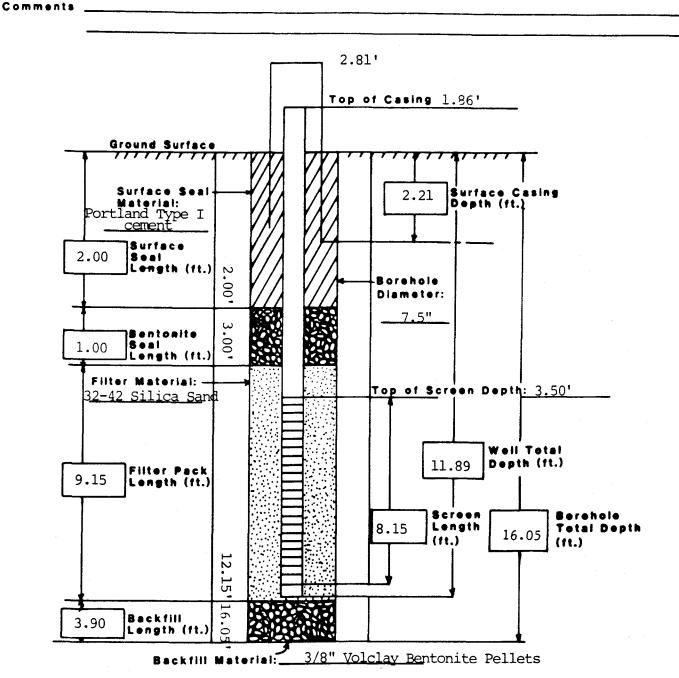
INDEX OF DATA

| Boring | No.: 19-87 | | | | | |
|---------|----------------------------------|--|--|--|--|--|
| Comple | Completed as well? Yes | | | | | |
| Data in | File | | | | | |
| X_ | Log of Borehole | | | | | |
| X_ | Well Construction Summaries | | | | | |
| | Well Development Summaries | | | | | |
| | Hydraulic Conductivity Test Data | | | | | |
| | and Results | | | | | |
| | Packer Test Data and Results | | | | | |
| X | Water Level Data | | | | | |

| Location Rocky Flat Coordinates N 36633. Total Depth 16.10' Drilling Company Boy Date Drilled August Drilling Method Holl Logged By J.B. Ber | des Bros Stem Auger Ground Surface Water Level Driller T. M. Heiper J. D. Drilling Fluid | Elevation 5967.98' Encountered None Static 5958.07' (12/01/8' erritt uncan None Site Manager |
|---|--|--|
| Comments | | ÆÉARP Manager |
| 10 15 | ROCKY FLATS ALLUVIUM 0.0-2.0' SAMPLE. Recovered 1.4/2.0' = 70%. CLAY AND GRAVEL: grayish brown (5 YR 3/2); abundant gray quartzite cobbles, pebbles and gravels; some roots and grasses; poorly sorted; unconsolidated; some caliche-reacts strongly with HCl; slightly damp. 2.0-4.0' SAMPLE. Recovered 1.9/2.0' = 95%. CLAY AND GRAVEL: pale yellowish brown (10 YR 6/2); clay, abundant caliche-strongly reacts with HCl; abundant quartzite pebbles and cobbles; angular; poorly sorted; unconsolidated; dry to slightly damp. 4.0-5.3' SAMPLE. Recovered 1.9/1.3' = 146%. CLAY AND GRAVEL: same as above with some moderate brown (5 YR 3/4) clay patches; dry. 5.3-6.0' SAMPLE. Recovered 0.7/0.7 = 100%. CLAY AND GRAVEL: same as above; dry. | HNu Background=0.4 OVA Background=0.0 No Ludlum readings taken. 2.0-4.0': Readings on core: HNu = 0.2-2.0; OVA = 0.0 4.0-5.3': Readings on core: HNu = 1-100; OVA = 0.0 8.1-11.1': Readings on core: HNu=0.4-1.2; OVA=0.0-2.0 14.1-16.1': Readings on core: HNu=2; OVA=1.2 |
| | 6.0-8.1' SAMPLE. No recovery. Drilled with center bit. | |

| Coordinates N 36633.42 E 23064.85 Total Depth 16.10' Drilling Company Boyles Bros Date Drilled August 5, 1987 Drilling Method Hollow Stem Auger Logged By J. B. Bergman Geologist | Borehole/Well No. 19-87 Ground Surface Elevation 5967.98' Water Level Encountered None Static 5958.07' (12/01/87 Driller T. Merritt Helper J. Duncan Drilling Fluid None Checked By Site Manager |
|---|--|
| Lithologic E | Samples Collected or Other Tests Performed |
| 8.1-11.1' SAMPLE. Recovered 3.0/3.0' = 10 SANDY CLAY AND brown (5 YR 3/4) and 5/6); sandy clay man quartzite gravels; po fine-grained; unconsol 11.1-14.1' SAMPLE. Recovered 3.0/3.0' = 10 11.1-11.4': CLAY: olivabundant caliche-rea HCl; trace moderate y YR 5/4) clay patches; bles and gravels; dry. | GRAVEL: moderate I light brown (5 YR crix with abundant borly sorted; very idated; dry. 00%. Ve gray (5 Y 3/2); cts strongly with vellowish brown (10 |
| ARAPAHOE F 11.4-14.1': CLAYSTON 3/2); some moderate mottles; abundant (white-reacts strongly black organics; dry. 14.1-16.1' SAMPLE. R 100%. CLAYSTONE: same as TOTAL DEPTH: 16.10 | JE: olive gray (5 Y brown (10 YR 5/4) CaCO ₃ concretions; with HCl; some decovered 2.0/2.0' = above; dry. |
| † † † † † † | |

WELL COMPLETION INFORMATION



12/11/87

water Level Data for Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft) Water Level Elev. (ft)

** Well Number: 1987

12/01/87

11.77

5969.84

5958.07

INDEX OF DATA

| Boring N | No.: 20-87BR | |
|------------------------|----------------------------------|--|
| Completed as well? Yes | | |
| Data in | File | |
| <u>x</u> _ | Log of Borehole | |
| X_ | Well Construction Summaries | |
| | Well Development Summaries | |
| | Hydraulic Conductivity Test Data | |
| | and Results | |
| <u>x</u> | Packer Test Data and Results | |
| X | Water Level Data | |

BOREHOLE Location Rocky Flats Plant: Mound Area Borehole/Well No. 20-87BR N 36644.48 E 23048.42 Coordinates 127.00' Total Depth Drilling Company Boyles Bros Date Drilled July 30-31 and Aug. 3, 1987 Drilling Method Hollow Stem Auger; Rotary Core Logged By J.B. Bergman; K.D. Holliway Geologist Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. Comments , Great ,0, Lithologic Description **ROCKY FLATS ALLUVIUM** HNu Background = 0.0-2.0' SAMPLE. Recovered 1.85/2.0' = 93%. GRAVEL: gray and pink quartzite in a moderate brown (5 YR 3/4) sand matrix; abundant roots and grasses in top 2"; unconsolidated; unsorted; dry. 5__ 30 2.0-4.0' SAMPLE. U Recovered 2.0/2.0' = 100%. 0.00

Ground Surface Elevation _ 5968.10' Water Level Encountered None Static 5861.19' (12/01/87) Driller T. Merritt; P. Bushkovski Helper T. High; J. Duncan; K. Parker 0 - 51.70': None

51.70' - 127.0': Water

Sire Manager Her

> Samples Collected or Other Tests Performed

CEARP Manager

0.2-0.4; OVA Background = 0.0; Ludlum Background = 0.0

4.0-6.4' SAMPLE.

ن کا ک

0 000

10

<u>15</u>

20

Recovered 2.4/2.4' = 100%.

5/6); abundant caliche; dry.

GRAVEL: moderate yellowish brown (10 YR 5/4) matrix of clay; abundant caliche; unsorted; unconsolidated; angular; moist.

SAND AND GRAVEL: grayish orange (10

YR 7/4); ~30% clay; light brown (5 YR

6.4-8.8' SAMPLE. LOST CORE. Drilled with center bit to get through boulders.

8.8-10.8' SAMPLE.

Recovered 1.3/2.0' = 65%.

SAND AND GRAVEL: moderate yellowish brown (10 YR 5/4) sand matrix with abundant quartzite pebbles and gravels; unconsolidated; unsorted; angular to subrounded; very fine-grained sand; moist.

10.8-13.8' SAMPLE.

Recovered 3.5/3.0' = 117%. 10.8-11.8': SAND AND GRAVEL: same as

above; moist.

18.8': Readings on core: HNu = 15.0 OVA = 12.0

Coordinates N 36644.48 E 23048.42
Total Depth 127.00'

Drilling Company Boyles Bros

Date Drilled July 30-31 and Aug. 3, 1987

Drilling Method Hollow Stem Auger; Rotary Core
Logged By J.B. Bergman; K.D. Holliway

Geologist

Borehole/Well No. 20-87BR

Ground Surface Elevation 5968.10'

Water Level Encountered None

Static 5861.19' (12/01/87)

Driller T. Merritt; P. Bushkovski

Helper T. High; J. Duncan; K. Parker

Drilling Fluid 0 - 51.70': None

51.70' - 127.0': Water

Site Manager

Cearp Manager

Surface casing set to 51.64' by J.B. Bergman on August 4, 1987.

1 2 mg/ Samples Collected or Lithologic Description Other Tests Performed **ARAPAHOE FORMATION** 20.8-23.8': Readings on core: HNu = 2.011.8-13.8': CLAYSTONE: medium gray (N OVA = 0.05/0) with abundant moderate yellowish brown (10 YR 5/4) mottles; abundant organic fragments; abundant 23.8-25.8': Readings caliche-reacts strongly with HCl; trace on core: HNu = 15.0white very fine-grained sand; well sorted; OVA = 3.0moist. <u>25</u> 13.8-15.8' SAMPLE. Recovered 2.0/2.0' = 100%. SANDY CLAYSTONE: moderate yellowish brown (10 YR 5/4); very fine-grained, light gray (N 6/0) sand and moderate yellowish brown (10 YR 5/4) sand; some caliche; some black organic fragments; well sorted; rounded; moist. 30 15.8-18.8' SAMPLE. Recovered 3.2/3.0° = 107%. CLAYSTONE: same as above; slightly moist. 34.70': Reading in 18.8-20.8' SAMPLE. well head: HNU = Recovered 2.0/2.0' = 100%. 20-30; OVA = 9.0 CLAYSTONE: same as above; moist. <u>35</u> 34.7-36.7': Readings 20.8-23.8' SAMPLE. on core: HNu = 2.0Recovered 3.0/3.0' = 100%. OVA = 1.8CLAYSTONE: olive gray (5 Y 3/2) with abundant moderate yellowish brown (10 YR 5/4) mottles; some organics; some caliche; trace light gray (N 6/0) sand; very fine-grained; rounded; moist. 40

Coordinates N 36644.48 E 23048.42
Total Depth 127.00'

Drilling Company Boyles Bros
Date Drilled July 30-31 and Aug. 3, 1987
Drilling Method Hollow Stem Auger; Rotary Core

Logged By J.B. Bergman; K.D. Holliway

Geologist

Borehole/Well No. 20-87BR

Ground Surface Elevation 5968.10'

Water Level Encountered None

Static 5861.19' (12/01/87)

Driller T. Merritt; P. Bushkovski

Helper T. High; J. Duncan; K. Parker

Drilling Fluid 0 - 51.70': None

Checked By 51.70' - 127.0': Water

Site Manager

Cearp Manager
Surface casing set to 51.64' by J.B. Bergman on August 4, 1987.

| Comments | Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. | | |
|-----------|---|--|--|
| 40 | Lithologic Description | Samples Collected or Other Tests Performe | |
| • | 23.8-25.8' SAMPLE. Recovered 2.0/2.0' = 100%. SANDY CLAYSTONE: same as above with slight increase in sand content; moist. | | |
| <u>45</u> | 25.8-28.8' SAMPLE. Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: same as above; moist. | | |
| 50 | 28.8-30.8' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 3/2) with abundant moderate yellowish brown (10 YR 5/4) mottles; abundant light brown (5 YR 5/6) FeO nodules; trace light gray (N 6/0) sandstone, very fine-grained; rounded; moist. | | |
| • | 30.8-33.8' SAMPLE. Recovered 3.0/3.0' = 100%. CLAYSTONE: same as above; moist. 33.8-34.7' SAMPLE. No sample. Adjust | No HNu, OVA, or Ludlum readings taken below 50.0'. 53.90-63.55': Packer | |
| <u>55</u> | depth after taking a TD of borehole. 34.7-36.7' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 3/2) with abundant light brown (5 YR 5/6) stains; wet at top 4"-probably slough; homoge- | Test Interval #10. | |
| | nous; dense; weathered; trace very fine- grained sand; dry. | 55.90-65.55': Packer Test Interval #9. 65.55-75.20': Packer Test Interval #8. | |
| <u>60</u> | | Page _3 01 _9 | |

Coordinates N 36644.48 E 23048.42

Total Depth 127.00'

Date Drilled July 30-31 and Aug. 3, 1987

Drilling Method Hollow Stem Auger; Rotary Core
Logged By J.B. Bergman; K.D. Holliway

Geologist

Ground Surface Elevation 5968.10'

Water Level Encountered None

Static 5861.19' (12/01/87)

Driller T. Merritt; P. Bushkovski

Helper T. High; J. Duncan; K. Parker

Drilling Fluid 0 - 51.70': None

51.70' - 127.0': Water

Checked By 51.70' - 127.0': Water Site Manager

CEARP Manager Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. Comments Samples Collected or Lithologic Description Other Tests Performed 36.7-39.7' SAMPLE. Recovered 3.5/2.0' = 88%. CLAYSTONE: olive gray (5 Y 3/2); some moderate yellowish brown (10 YR 5/4) stains; slightly weathered; homogenous; dense; abundant FeO nodules; some organic fragments; slightly moist. <u>65</u> 39.7-41.7' SAMPLE. Recovered 2.1/2.0' = 105%. CLAYSTONE: same as above; slightly moist. 41.7-44.7' SAMPLE. Recovered 1.7/3.0' = 85%. CLAYSTONE: same as above; dry. 44.7-46.7' SAMPLE. 70 Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 3/2); some dark yellowish orange (10 YR 6/6) stains; friable; homogenous; some vertical fractures; dry. 46.7-49.7' SAMPLE. Recovered 3.7/3.0' = 123%. CLAYSTONE: same as above; unwea-75.20-84.85': Packer 75 thered/weathered contact at 46.7'; dry. Test Interval #7. 49.7-51.7' SAMPLE. Recovered 3.5/2.0' = 175%. 77.20-86.85': Packer CLAYSTONE: same as above; unwea-Test Interval #6. thered; dry. _80

LOG OF

BOREHOLE Location Rocky Flats Plant: Mound Area Coordinates N 36644.48 E 23048.42 127.00' Total Depth Drilling Company Boyles Bros Date Drilled July 30-31 and Aug. 3, 1987 Drilling Fiuld 0 - 51.70': None Drilling Method Hollow Stem Auger; Rotary Core Logged By J.B. Bergman; K.D. Holliway Geologist Comments Lithologic Description 50.0-54.0' SAMPLE. Recovered 2.0/4.0' = 50%.

leaves); dry.

95

Borehole/Well No. 20-87BR Ground Surface Elevation 5968.10' Water Level Encountered None Static _5861.19' (12/01/87) Driller T. Merritt; P. Bushkovski Helper T. High; J. Duncan; K. Parker

51.70' - 127.0': Water

Site Manager

CEARP Manager Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. Samples Collected or Other Tests Performed RQD = 1.1/2.0' = 55%. CLAYSTONE: olive black (5 Y 2/1); unweathered; damp. 54.0-58.0' SAMPLE. Recovered 5.0/4.0' = 125%. 85 RQD = 4.45/5.0' = 89%.CLAYSTONE: olive black (5 Y 2/1); some silt; unweathered; damp. 86.86-96.50': Packer Test Interval #5. 58.0-62.0' SAMPLE. Recovered $4.0/4.0^{\circ} = 100\%$. RQD = 4.00/4.0' = 100%.58.0-60.0': CLAYSTONE: dark gray; some silt; some very fine-grained sand; damp. 60.0-62.0': SANDY CLAYSTONE: light 90 gray; some clay; some silt; some very finegrained sand; fairly well sorted; subrounded; trace fossils (plant stems and

> 62.0-66.0' SAMPLE. Recovered 3.95/4.0' = 98.8%. RQD = 2.70/3.95' = 68.35%.SANDY CLAYSTONE: olive black (5 Y 2/1); sand is 3.0-3.5 phi to very finegrained; subrounded; some silt; some clay;

trace fossils (plant stems and leaves); damp to dry.

96.50-106.15': Packer Test Interval #4.

100

Location Rocky Flats Plant: Mound Area Coordinates N 36644.48 E 23048.42 127.00' Total Depth _

Drilling Company Boyles Bros Date Drilled July 30-31 and Aug. 3, 1987 Drilling Method Hollow Stem Auger; Rotary Core Logged By J.B. Bergman; K.D. Holliway Geologist

Borehole/Well No. 20-87BR Ground Surface Elevation 5968.101 Water Level Encountered None

Static <u>5861.19' (12/01/87)</u> Driller T. Merritt; P. Bushkovski

Helper T. High; J. Duncan; K. Parker

Drilling Fiuld 0 - 51.70': None

51.70' - 127.0': Water Site Manager

CEARP Manager Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. Comments • Samples Collected or Lithologic Description

66.0-70.0' SAMPLE. Recovered $3.7/4.0^{\circ} = 92.5\%$. RQD = 2.91/3.7' = 78.6%. SANDY CLAYSTONE: same as above;

very light gray (N 8/0) to grayish black (N 2/0); presence of vertical lamination planes of sand; very fine-grained to 3.0-3.5 phi, starting at 67.1'; damp to dry.

70.0-74.0' SAMPLE.

<u>10</u>5

110

115

120

Recovered 5.2/4.0' = 130%. RQD = 4.8/5.2' = 92.3%.

SANDY CLAYSTONE: same as above; vertical lamination planes fade out at 70.5' but reappear at 71.6'-72.8'; damp to dry.

74.0-78.0' SAMPLE.

Recovered 4.0/4.0' = 100%. RQD = 3.0/4.0' = 60.5%. SANDY CLAYSTONE: same as above; damp to dry.

78.0-79.5' SAMPLE.

Recovered 0.5/1.5' = 33.3%. RQD = 0.5/0.5' = 100%.

SILTY CLAYSTONE: dark gray (N 3/0) to light gray (N 7/0); some clay; some silt; some sand 3.5-2.5 phi to very finegrained; mottled; indurated; dry.

79,5-82.0' SAMPLE.

Recovered 3.5/2.5' = 140%. RQD = 2.42/3.5' = 69.1%.SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some clay; some silt; some sand; occasional small seams of coal; damp.

106.15-115.80': Packer Test Interval #2.

107.20-116.85": Packer Test Interval #3.

114.42-124.07': Packer Test Interval #1.

Borehole/Well No. 20-87BR Location Rocky Flats Plant: Mound Area Ground Surface Elevation 5968.10' Coordinates N 36644.48 E 23048.42 127.00' Water Level Encountered None Total Depth _ Static 5861.19' (12/01/87) Driller T. Merritt; P. Bushkovski Drilling Company Boyles Bros Helper T. High; J. Duncan; K. Parker Date Drilled July 30-31 and Aug. 3, 1987 Drilling Fluid 0 - 51.70': None Drilling Method Hollow Stem Auger; Rotary Core 51.70' - 127.0': Water Logged By J.B. Bergman; K.D. Holliway Site Manager Geologist CEARP Manager Surface casing set to 51.64' by J.B. Bergman on August 4, 1987. Comments Samples Collected or Lithologic Description 82.0-84.5' SAMPLE. Recovered 2.15/2.5' = 86%. RQD = 1.48/2.15 = 68.8%. SILTY CLAYSTONE: same as above except less sand; damp. 84.5-88.0' SAMPLE. Recovered 3.1/3.5' = 88.6%. RQD = 2.68/3.1' = 86.5%.125 SILTY CLAYSTONE: same as above; except more sand in lenses; damp to dry. 88.0-92.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.76/4.0' = 94%.SILTY CLAYSTONE: same as above; damp. <u>13</u>0 92.0-96.0' SAMPLE. Recovered 1.65/4.0° = 41.25%. RQD = 1.65/1.65' = 100%.SILTY CLAYSTONE: same as above; dry. 96.0-99.0' SAMPLE. Recovered 3.4/3.0' = 113%. RQD = 2.5/3.4' = 73.5%.SILTY CLAYSTONE: same as above; dry. 99.0-102.0' SAMPLE. Recovered 2.7/3.0' = 90%. RQD = 1.38/2.7' = 53%. SILTY CLAYSTONE: same as above; dry.

| Location Rocky Flats | - Dlant, Mound Area | | No. <u>20-87BR</u> | |
|------------------------|--|----------------|--------------------------------------|---|
| Coordinates N 36644 | | | • Elevation 596 | 8 10' |
| Total Depth 127.00 | | | Encountered Non | |
| 10ts/ Depth | | Water Eaver | | |
| | Law Breeze | m v | Static <u>5861.19'</u> | |
| Drilling Company Boy | | | erritt; P. Bushko | |
| Date Drilled July 30-3 | 31 and Aug. 3, 198/ | Helper T. H | gh; J. Duncan; K | . Parker |
| Drilling Method Hollow | v Stem Auger; Rotary Core | Drilling Fluid | 0 - 51.70': None 51.70' - 127.0': | |
| Logged By J.B. Berg | | Checked By _ | | <u>\</u> |
| G◆ | ologist | | Site Ma | nager |
| | | - | CEARP M | anager |
| Comments Surface of | casing set to 51.64' by J.B. | . Bergman on | August 4, 1987. | |
| | | | | |
| | | | | |
| /5 /5 /. | • / | | / | |
| | S Lithologic Descrip | tion | Other Tests | Performed |
| | | | | • |
| | | | | |
| 1 1 | $\frac{102.0-105.0'}{\text{Recovered } 5.0/3.0'} = 167\%.$ | | | İ |
| ŢŢ | ROD = 3.8/5.0' = 76%. | | | ı |
| + + - | SILTY CLAYSTONE: green | ish black (5 | | [|
| | GY 2/1); some clay; some sil | lt; some sand | | I |
| + + - | lenses; thin sand laminatio | n; recovered | | İ |
| | 2.0' of silty clay core from 1 | previous run; | | ı |
| T T | dry. | | | 1 |
| _ + + - | 1050 1000 2 CAMPLE | | | |
| | $\frac{105.0-109.0' \text{ SAMPLE.}}{\text{Recovered } 4.0/4.0' = 100\%.}$ | | | |
| † † † | RQD = 4.0/4.0' = 100%. | | | |
| + + - | 105-107.25': CLAYSTONE, S | SANDSTONE | | |
| | AND SILTSTONE: same as at | | | 1 |
| + + - | 107.25'-109.0': CLAYEY S. | | | |
| | olive black (5 Y 2/1); sand subangular; 2.5-1.5 phi; clay | | | |
| ŢŢŢ | more prominent 108.75-109.0; | | | |
| _ + + + | h | | | |
| | 109.0-113.0' SAMPLE. | | | |
| † † 1 | Recovered 4.0/4.0' = 100%. | | | |
| + + + | RQD = 4.0/4.0' = 100%. CLAYEY SANDSTONE: sam | a as above | | |
| | except finer grained 3.0-3.5 | | | |
| + + + | mented; damp. | pm, won co- | | { |
| 1 1 | | | | İ |
| TT | 113.0-117.0' SAMPLE. | | | İ |
| - + + + | Recovered $4.0/4.0^{\circ} = 100\%$. | | | |
| .] | RQD = 4.0/4.0' = 100%. - 113.0-115.8': CLAYEY SANDS | STONE: 1:abt | 1 | |
| | gray (N 7/0); sand 3.0-3.5 phi | | | |
| + + - | well cemented; moist. | ,, | | |
| | 115.8-117.0': SANDY C | LAYSTONE: | | |
| † † † | medium gray (5 N/0); some | clay; some | | |

8

Coordinates N 36644.48 E 23048.42
Total Depth 127.00'

Drilling Company Boyles Bros
Date Drilled July 30-31 and Aug. 3, 1987

Drilling Method Hollow Stem Auger; Rotary Core
Logged By J.B. Bergman; K.D. Holliway

Geologist

Borehole/Well No. 20-87BR

Ground Surface Elevation 5968.10'

Water Level Encountered None

Static 5861.19' (12/01/87)

Driller T. Merritt; P. Bushkovski

Helper T. High; J. Duncan; K. Parker

Drilling Fluid 0 - 51.70': None

51.70' - 127.0': Water

Site Manager

Cearp Manager
Surface casing set to 51.64' by J.B. Bergman on August 4, 1987.

| | Lithologic Description | Samples Collected or Other Tests Performe |
|-----|--|--|
| | 117.0-121.0' SAMPLE. Recovered 3.6/4.0' = 90%. RQD = 2.5/3.6' = 77.7%. 117-118.5': CLAYSTONE: medium gray (5 N/0); blocky; moderately cemented; moist. 118.5-119.5': CLAYEY SANDSTONE: light gray (N 7/0); moderate cementation; slightly moist. 119.5-121.0': CLAYSTONE: medium gray (5 N/0); sand fine-grained; moist. | |
| | 121.0-125.0' SAMPLE. Recovered 1.5/4.0' = 37.5%. RQD = 1.2/1.5' = 80%. CLAYSTONE: same as above; massive; moist. | |
| - | 125.0-127.0' SAMPLE. Recovered 3.8/2.0' = 190%. RQD = 2.5/3.8' = 66%. CLAYSTONE: same as above; recovered 1.8' of claystone; same description from previous core run; moist. | |
| _ | TOTAL DEPTH: 127.00' | |
| + + | + | |

WELL COMPLETION INFORMATION

Coordinates N 36644.48 E 23048.42

Total Depth: Well 116.36'

Borehole 126.20'

Formation of Completion Arapahoe Formation

Casing Material Sch 5, type 316 TFJ stainless steel

Steel Steel Casing Diameter 2" ID

Site Manager

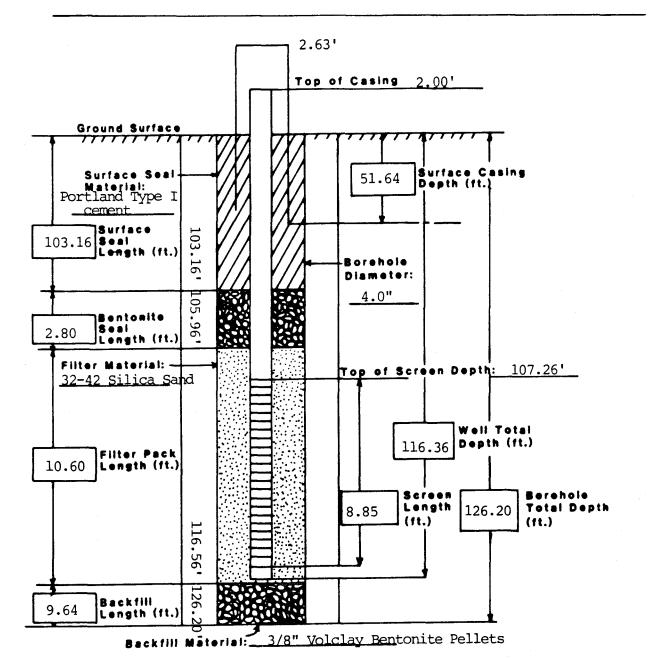
Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter

Date Installed Aug 12, 1987 stainless steel Approved By

Installed By K.D. Holliway

Geologist

Comments Surface casing set to 51.64' by J.B. Bergman on August 4, 1987.



ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 8/11/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 53.90 - 63.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 106.91

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00023169 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 58.72 + 7.02 + .00 * 2.31 = 65.74
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002360 FT/MIN
K = .00000012 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00013032 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 58.72 + 5.32 + 13.60 * 2.31 = 95.46
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000914 FT/MIN<math>K = .00000005 CM/SEC

ROCLY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 8/11/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 65.55 - 75.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 106.91

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000000598 FT/MIN
 K = .00000003 CM/SEC

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 8/11/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 75.20 - 84.85
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 106.91

$$K = ----- LN(--)$$

2 (PI) (L) (H) R

1ST P1/3 TEST

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000000754 FT/MIN<math>K = .00000004 CM/SEC

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 8/11/87

BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 86.85 - 96.50

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 106.91

1ST P1/3 TEST

P2/3 TEST

Q = INJECTION RATE = .00040545 (FEET3/MIN) L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS ABOVE WATER TABLE HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

= 91.68 + 5.32 + 21.50 * 2.31 = 146.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001851 FT/MIN K = .00000009 CM/SEC

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 08/10/87 BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 96.50 - 106.15

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 106.91

K = ---- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

P2/3 TEST

Q = INJECTION RATE = .00049234 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 101.32 + 5.32 + 23.80 * 2.31 = 161.62

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000020 FT/MIN

K = .00000010 CM/SEC

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 8/10/87 BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 107.20 - 116.85 MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 106.91

$$K = \frac{Q}{Q} L (--)$$
 $(PI) (L) (H) R$

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

.00 * 2.31 = 116.28= 106.91 + 9.37 +

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000083 FT/MIN

K = .00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00050682 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 106.91 + 5.32 + 29.30 * 2.31 = 179.91

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001886 FT/MIN

K = .00000010 CM/SEC

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 8/10/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 106.15 - 115.80
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 106.91

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000001952 FT/MIN K = .00000010 CM/SEC

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02 DATE TESTED: 8/10/87 BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 114.42 - 124.07

MATERIAL TESTED: ARAPAHOE SANDSTONE DEPTH TO WATER (FEET BELOW G.S.): 106.91

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$

1ST P1/3 TEST

Q = INJECTION RATE = .00380837 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 106.91 + 9.95 + .00 * 2.31 = 116.86

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000021820 FT/MIN

K = .00000111 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00024617 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 106.91 + 5.32 + 28.20 * 2.31 = 177.37

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000929 FT/MIN

K = .00000005 CM/SEC

5, and 10 gained water in tube on second 1/3 pressure Geologiet Date of Water Level: 12/1/87 Static Water Level: 106,91. Ξ KDI and 8 are invalid due to water Ξ KDH ₩ R KDI ₩ ₩ Ē KDI # 1, 3, 5, and 10 gained water in tube on second 1/3 no Kass/ KCI Kass/ KUI Kass/ KCI Lareten Kass Kass Kass Kass Kass Kass KCL KCL KCJ. KCL KCI. K ō Date of Test 8/10/87 8/10/87 8/10/87 8/10/87 8/11/87 8/11/87 8/11/87 8/10/87 8/10/87 8/10/87 8/11/87 8/11/87 8/10/87 8/10/87 8/10/87 8/10/87 8/10/87 8/11/87 0.355 0.010 -0.045-0.045 40 -0.075 -0.02 -0.050.10 2.63 -0.190.35 -0.13-0.02 0.28 0.17 0.34 -0.010.00 **,** Gege Helgh +Avg. H2O Helghi Comments: Test Intervals # 2, 5.32 9.95 5.32 5.32 5.32 5.32 8.18 8.16 9.18 9.50 9.08 99.6 8.25 9.46 9.37 PACKER TEST DATA SHEET Ave. H₂O Height test. 4.63 3.86 4.18 3.76 4.05 4.34 2.93 2.68 2.84 2.67 N/A N/A N/A N/A N/A N/A Gege Height 5.32 5.32 5.32 5.32 5.32 5.32 5.32 5.32 5.32 5,32 5.32 5.32 5.32 5.32 5.32 5.32 5.32 5.32 George Feet 23.8 S 21. 18. 26 0 0 0 0 0 0 0 d þ 0 0 d Test Length (minutes) Location: Rocky Flats Plant; Mound Area 4 15 15 15 15 15 15 15 15 15 5 15 15 15 1 13 Acrylic Tube Diameter: 0.1663 0.333 Bottom of Test Interval 124.07 115.80 116.85 106,15 84.85 96.50 2029-17-02 20-87BR Top of Test Interval Borehole Diameter: 114.42 106.15 107 20 86.85 96.50 75.20 Well No.: Teet Interval No. Job No.: 2 2 7 \sim

| | | | | PACK | KER TEST | 4.44 | | | | | |
|---------------|----------------------|---|-------------------|----------|-------------|--------|----------------------------------|--------|--------------|------------------------------|-----------|
| Job No. | Job No.: _2029-17-02 | 2 | | | | AL OUR | | | | | |
| Location: | Rocky Fla | Location: Rocky Flats Plant: Mound Area | Yound Area | | | | | | Static W | Static Water Level: 106.91 | 10.91 |
| Well No. | 20-87B | 20-87BR (CON'T) | | | | | | | Date of | Date of Water Level: 12/1/87 | : 12/1/87 |
| Borehole | Borehole Diameter: | 0.333 | | °5 | Comments: | | | | Page 2 | -01-2 | |
| Acrylic Te | ube Diamete | Acrylic Tube Diameter: 0.1663 | | | 1 | | | | | | |
| Took Interval | ٤ | Bottom of | | O BOO | | 4 | Gege Helek | | | | |
| g , | Merve | Tool Interval | (minutes) | Property | Gage Height | Helph | +Avg. H ₂ O Height | Δ٨ | Date of Test | Libration | Geologiet |
| ∞ | 65.55 | 75.20 | 15 | 0 | 5.32 | 2,725 | 8.045 | -0.07 | 8/11/87 | KCI | |
| | | | 15 | 16.4 | 5.32 | N/A | 5.32 | 0.07 | 8/11/87 | KCI | NO. |
|] | | | 15 | 0 | 5.32 | 2.56 | 7.88 | -0.05 | 8/11/87 | 1021 | |
| 10 | 53.90 | 63.55 | 15 | 0 | 5.32 | 1.70 | 7.02 | 0.16 | 8/11/87 | 1.77 | IION . |
| | | | 15 | 13.6 | 5.32 | N/A | 5.32 | 0.09 | 8/11/87 | KCI | |
| | | | 15 | 0 | 5.32 | 2.77 | 8.09 | -0.015 | 8/11/87 | KCI. | |
| | | | | | | | | | | | |
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12/11/87

Water Level Data

for

Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft) Water Level Elev. (ft)

** Well Number: 2087BR

12/01/87

108.91

5970.10

5861.19

INDEX OF DATA

| Boring | Boring No.: 21-87 | | |
|------------------------|----------------------------------|--|--|
| Completed as well? Yes | | | |
| Data in | File | | |
| X_ | Log of Borehole | | |
| <u>x</u> | Well Construction Summaries | | |
| | Well Development Summaries | | |
| | Hydraulic Conductivity Test Data | | |
| | and Results | | |
| | Packer Test Data and Results | | |
| X | Water Level Data | | |

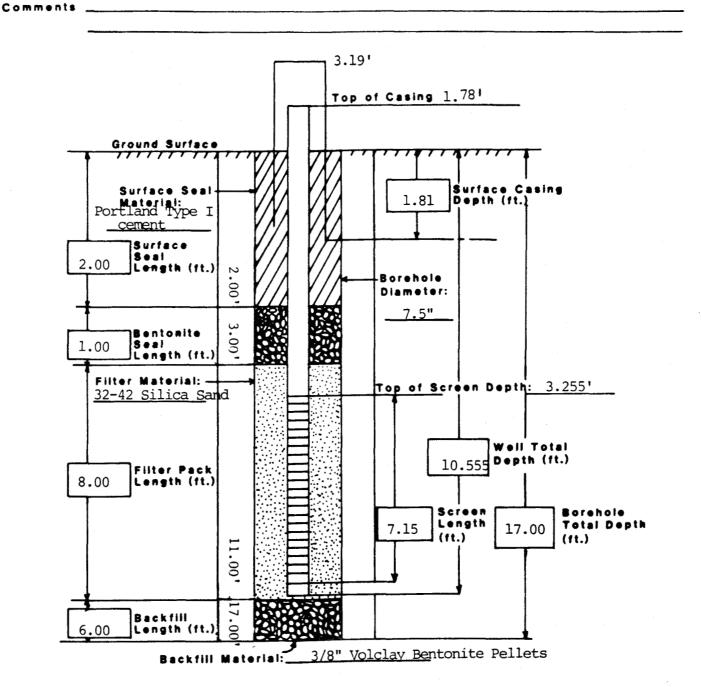
| Location | Rocky Flats Plant; Mound Area | Borehole/Well | |
|------------|--|-----------------------------------|--|
| Coordina | N 36980.21 E 22693.84 | Ground Surfac | • Elevation _5927.58' |
| Total De | pth17.00' | Water Level | Encountered 7.0' |
| | | | Static Dry |
| Drilling C | Company Boyles Bros | Driller R. S | |
| | Ned October 16, 1987 | | |
| | | Heiper T. M | |
| Drilling N | ethod <u>Hollow Stem Auger</u> | Drilling Fluid | None |
| Logged E | By _K.D. Holliway | Checked By _ | Altase V |
| | Geologist | | 2 Site Manager |
| | | - | CEARP Manager |
| Comment | ts | | |
| | Lithologic De | escription | Samples Collected or Other Tests Performer |
| 00 | Lithologie D | | |
| | COLLUY | /IUM | HNu Background=1.3 |
| | | | OVA Background=2.8 |
| | 0.0-2.0' SAMPLE. | | Alpha Background = |
| | Recovered $1.9/2.0' = 95$ | 5%. | 0.1 |
| | SANDY CLAY: dark y | ellowish brown (10 | |
| | $\frac{1}{2}$ YR 4/2) to dusky ye | ellowish brown (10 | 0.0-2.0': Readings on |
| | YR 2/2); quartzite of | cobbles, broken to | core: HNu = 7.0; |
| | subangular; sand v | very fine-grained; | OVA = 3.2. |
| <u>5</u> | poorly sorted; unconse | oldiated; grass and | |
| | roots to 0.2'; reactive to | o HCI; damp. | 2.0-4.0': Readings on |
| | 20.401.543471.5 | | core: HNu = 200; OVA = 3.6. |
| | $\frac{2.0-4.0' \text{ SAMPLE.}}{\text{Recovered } 1.0/2.0'} = 50$ | 10% | OVA = 3.0. |
| | SANDY CLAY: same a | | |
| | SANDI CLAT. Same a | s above, aump. | 7.0-9.5': Readings on |
| | 4.0-7.0' SAMPLE. | | core: HNu = 5.0; |
| | Recovered $0.3/3.0' = 10$ |)%. | OVA = 3.8. |
| 10 | CLAY: light olive gray | | |
| 10 | quartzite cobbles; trac | e very fine-grained | } |
| | sand; unconsolidated; of | | |
| | | | |
| | 7.0-9.5' SAMPLE. | | |
| | Recovered $2.5/2.5' = 10$ | | |
| | 7.0-8.8': CLAY: light o | | |
| | occasional subrounded | | |
| | trace very fine-graine | | 1 |
| <u>15</u> | nodules; damp to mois 8.8-9.5': SANDY CLA | | 1 |
| | brown (10 YR 2/2); | |] |
| | sand; some organics; m | | 1 |
| | | · · · · · · · · · · · · · · · · · | |
| | | | |
| | | | |
| | + + + | | |
| | | | |
| | + + + | | 1 |

| Coordinates N 36980.21 E 22693.3 Total Depth 17.00' Drilling Company Boyles Bros Date Drilled October 16, 1987 Drilling Method Hollow Stem Auger Logged By K. D. Holliway Geologist | Ground Surface Elevation 5927.58' Water Level Encountered 7.0' Static Dry Driller R. Sharp Helper T. Merritt |
|--|--|
| Comments Litho | Samples Collected or Other Tests Performed |
| 9.5-12.0' SAMP Recovered 2.5/ 9.5-10.4': SANI (5 Y 5/2); rounded quar grained sand; moist. ARAPA 10.4-12.0': SAI olive gray (5 5/0) with dark | OY CLAY: light olive gray occasional subrounded to tzite pebbles; very fine-trace caliche; damp to AHOE FORMATION NDY CLAYSTONE: light Y 5/2) to medium gray (Now yellowish orange (10 YR ing; very fine-grained sand; |
| moist. 14.5-17.0' SAM Recovered 2.3/ CLAYSTONE: trace dark yel iron staining; | 2.5' = 100%. same as above; damp to PLE. 2.5' = 92%. olive gray (5 Y 4/1) with lowish orange (10 YR 6/6) some very fine-grained |
| sand more the damp to moist. TOTAL DEPT | |

WELL COMPLETION INFORMATION

Well No. ____21-87 Location Rocky Flats Plant: Mound Area Elevation: Ground Surface _5927.581 Coordinates N 36980.21 E 22693.84 Total Depth: Well 10.555' Top of Casing _____5929.36! Borehole 17.00' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter ___ Screen Material 0.010" wire wrap, type 316 TFJ

Stainless steel Surface Casing Diameter Date Installed Oct. 16, 1987 Approved By Sive Wanager IN Thuis CEARP Manager Installed By K. D. Holliway Geologist



12,11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC TOC (ft)

Water Level Elev. (ft)

** Well Number: 2187

12/01/87

-1.00

5929.36

INDEX OF DATA

| Boring | No.: 22-87BR |
|--------------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> </u> | Log of Borehole |
| <u> </u> | Well Construction Summaries |
| | Well Development Summaries |
| ` | Hydraulic Conductivity Test Data |
| | and Results |
| <u> </u> | Packer Test Data and Results |
| X_ | Water Level Data |

Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Drilling Company Boyles Bros

Date Drilled Sept 30 & Oct 7-8, 1987

Drilling Method Hollow Stem Auger; Rotary Core

Logged By K.D. Holliway; J.B. Bergman

Geologist

Borehole/Well No. 22-87BRGround Surface Elevation 5930.70° Water Level Encountered 12.2° Static 5852.04° (12/01/87)

Driller R. Sharp

Helper T. Merritt

Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Wa

Checked By

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1927

| Comments | Surrace cas | and set to 43.59 by K.D. Holliway Off | October 27 2337 |
|-----------|-------------|---|--|
| 0 | | Lithologic Description | Samples Collected or Other Tests Performed |
| | | COLLUVIUM 0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYEY SAND: moderate yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); subrounded to subangular quartzite cobbles and pebbles; sand | HNu Background=0.6 OVA Background=1.2 0-2.0': Readings on core: HNu = 1.0; OVA = 4.0. |
| <u>5</u> | | fine-grained to coarse-grained; poorly sorted; calcareous; unconsolidated; some caliche; dry. 2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAYEY SAND: same as above; dry. 4.0-6.0' SAMPLE. | 2.0-4.0': Readings on core: HNu = 4.0; OVA = 1.2. 4.0-6.0': Readings on core: HNu = Background; OVA = 1.6. |
| 10 | | Recovered 2.0/2.0' = 100%. CLAY: light olive gray (5 Y 5/2) to dusky yellowish brown (10 YR 2/2); trace subrounded quartzite cobbles; trace very fine-grained sand; trace caliche; damp. 6.0-8.0' SAMPLE. | 6.0-8.0': Readings on core: HNu = 1.2; OVA = 10. |
| <u>15</u> | | Recovered 2.0/2.0' = 100%. CLAY: same as above except with dark yellowish orange (10 YR 6/6) iron staining and stringers of brownish gray (5 YR 4/1) claystone; damp. 8.0-10.2' SAMPLE. Recovered 2.2/2.2' = 100%. CLAY: light olive brown (5 Y 5/6) to light olive gray (5 Y 5/2); some iron staining; some sand; trace caliche; damp. | 8.0': Readings in augers: OVA = 100.0; HNu = 1.2. 8.0-10.2': Readings in core: HNu = Background; OVA = 2.0. 10.2-12.2': Readings on core: HNu = 2.0; |
| <u>20</u> | | | OVA = 20. |

Location Rocky Flats Plant: Mound Area Borehole/Well No. 22-87BR Coordinates <u>N 36934.99</u> E 22715.72 Ground Surface Elevation 5930.701 Total Depth 110.40' Water Level Encountered $\underline{12.2}$ Static 5852.04' (12/01/87) Drilling Company Boyles Bros Driller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water Logged By K.D. Holliway; J.B. Bergman Checked By Geologist Site Manage CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1927 , ° Samples Collected or Lithologic Description Other Tests Performed 12.2-26.5': No 10.2-12.2' SAMPLE. readings above Recovered 2.0/2.0' = 100%. background on the CLAY: light olive gray (5 Y 5/2); some core. very fine-grained sand stained dark yellowish orange (10 YR 6/6); subrounded quartzite cobbles; some iron staining; trace caliche; damp. 12.2-14.2' SAMPLE. 25 Recovered 2.0/2.0' = 100%. 12.2-12.8': SANDY CLAY: same as above; 26.5-27.5': Readings moist to wet. on core: HNu = Background; OVA = 1.6. **ARAPAHOE FORMATION** 12.8-14.2': SANDY CLAYSTONE: same as 28.5-29.5': Readings above except no quartzite cobbles; moist on core: HNu = 2.0: to wet. 30 OVA = 1.0. 14.2-16.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2); some very fine-grained sand; some dusky yellow (5 Y 6/4); trace caliche; damp to moist. 16.2-18.2' SAMPLE: Recovered 2.0/2.0' = 100%. 35 CLAYSTONE: olive gray (5 Y 4/1); occasional dark yellowish orange (10 YR 6/6) iron staining; trace very fine-grained sand; trace caliche; damp. 18.2-20.2' SAMPLE,

Recovered 2.0/2.0' = 100%.

40

CLAYSTONE: same as above; damp.

Page ____ of ___11

| Coordinates N 36934.99 E 22715.72 Total Depth 110.40' Drilling Company Boyles Bros Date Drilled Sept 30 & Oct 7-8, 1987 Drilling Method Hollow Stem Auger; Rotary Logged By K.D. Holliway; J.B. Bergman Geologist Commants Surface casing set to 43.59' | Checked By Site Manager CEARP Manager |
|--|--|
| Lithologic | Samples Collected or Other Tests Performed |
| 20.2-22.2' SAMPLE. Recovered 2.0/2.0' = CLAYSTONE: same Hole readjusted to 2' 22.5-23.5' SAMPLE. Recovered 1.5/1.0' = CLAYSTONE: same olive gray (5 Y 5/2) lowish orange (10 Y no caliche; dry. 23.5-24.5' SAMPLE. Recovered 1.0/1.0' = CLAYSTONE: same iron staining; homog damp. 24.5-25.5' SAMPLE. Recovered 1.4/1.0' = CLAYSTONE: same slightly damp. 25.5-26.5' SAMPLE. Recovered 1.4/1.0' = CLAYSTONE: light with trace dark yell 6/6) iron staining in | as above; damp. 2.50'. 150%. as above except light with trace dark yellow with trace dark yellow. The first interval #7. 100%. as above except notenous; dry to slightly. 140%. as above; dry to 52.55-62.20': Packer Test Interval #6. 140%. olive gray (5 Y 5/2) owish orange (10 YR small fractures; trace and; trace silt; damp to |

| Coordinat Total Dep Drilling Co Date Drilling Mo | th 110.4 | ts Plant; Mound Area 934.99 E 22715.72 O' Dyles Bros 0 & Oct 7-8, 1987 low Stem Auger; Rotary Core lliway; J.B. Bergman | Water Level (Driller R. Sh Helper T. Me | Elevation 5930.70' Encountered 12.2' Static 5852.04' (12/01/87) paro Pritt 0.0 - 45.1' None; 45.1' - 110.4' Water |
|--|----------|--|---|---|
| Comments | | casing set to 43.59' by K.I | O. Holliway on | CEARP Manager October 2, 1987 |
| 60 | | Lithologic Descr | iption | Samples Collected or Other Tests Performed |
| 65 | | 27.5-28.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as a moist. 28.5-29.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as about iron staining; damp. 29.5-30.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as about ics; damp. | bove; damp to | 62.20-71.85': Packer Test Interval #5. |
| <u>70</u> | | 30.5-31.5' SAMPLE. Recovered 1.5/1.0' = 150%. SANDY CLAYSTONE: light Y 5/2) with dark yellow YR 6/6) iron staining and (10 YR 7/4) very fine-grided sands; occasional lint some silt; some organics; days and the same silt; some organics; days are some silt; some organics; days are some silt; some organics; days are some silt; some organics; days are some silt; some organics; days are some silt; some organics; days are some silt; some silt; trace organics; days are some silt; days are some silt; trace organics; days are some silt; trace organics; days are some silt; days are | rish orange (10 grayish orange ained interbed- nonite nodules; ry. ive black (5 Y y (5 Y 5/2); a staining modery fine-grained orange (10 YR) | 71.85-81.50': Packer Test Interval #4. |
| | | | | |

Coordinates N 36934.99 E 22715.72

Total Depth 110.40'

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Bergman
Geologist

Borehole/Well No. 22-87BR

Ground Surface Elevation 5930.70'

Water Level Encountered 12.2'

Stetic 5852.04' (12/01/87)

Driller R. Sharp

Helper T. Merritt

Drilling Fluid 0.0 - 45.1' None;

Checked By

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CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| 80 | Lithologic Description | Samples Collected or Other Tests Performe |
|-----------|---|--|
| | 32.5-33.5' SAMPLE. Recovered 1.2/1.0' = 120%. | 81.50-91.15': Packer Test Interval #3. |
| | CLAYSTONE: same as above except no interbedded sands; no nodules; less sand; dry. | 82.70-92.35': Packer Test Interval #2. |
| <u>85</u> | 33.5-34.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: light olive gray (5 Y 5/2) to olive black (5 Y 2/1) with some moderate yellowish brown iron staining (10 YR 5/4); some very fine-grained sand; some silt; some organics; brittle; dry. | |
| | 34.5-35.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above; dry. | |
| 90 | 35.5-36.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: olive black (5 Y 2/1) to grayish black (N 2/0); some very fine-grained sand; some silt; some organics; trace limonite nodules; dry. Weathered/unweathered contact = 36.0'. | 92.35-102.0': Packer Test Interval #1. |
| 95 | 36.5-37.5' SAMPLE. Recovered 2.0/1.0' = 200%. CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand in fractures with dark yellowish orange (10 YR 6/6) iron staining; some organics; dry to slightly damp. | |
| 100 | | age _ 5 _ of _ 11 _ |

| Location Rocky Flats Plant; Mound Area | Borehole, Well No. 22-87BR |
|---|--|
| Coordinates N 36934.99 E 22715.72 | Ground Surface Elevation 5930.701 |
| Total Depth 110.40' | Water Level Encountered 12.2' |
| | Static 5852.04' (12/01/87) |
| Drilling Company Boyles Bros | Driller R. Sharp |
| Date Drilled Sept 30 & Oct 7-8, 1987 | |
| | Helper T. Merritt |
| Drilling Method Hollow Stem Auger; Rotary Core | Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water |
| Logged By K.D. Holliway; J.B. Bergman Geologist | Checked By Site Manager |
| Geologist | Site manager |
| | CEARP Manager |
| Comments Surface casing set to 43.59' by K.D. | O. Holliway on October 2, 1987 |
| | |
| | |
| Lithologic Descr | Samples Collected or |
| Lithologic Descr | |
| 100/84/67/94/ | |
| | |
| 37.5-38.5' SAMPLE. | i |
| Recovered 1.0/1.0' = 100%. | |
| CLAYSTONE: same as about sands; dry. | ove with more |
| Sands, dry. | |
| 38.5-39.5' SAMPLE. | |
| Recovered $1.3/1.0' = 130\%$. | |
| CLAYSTONE: olive black | (5 Y 2/1) to |
| dark gray (N 3/0); some ver | |
| sand with moderate yellow | |
| YR 5/4) staining; some sil | |
| ics; dry. | |
| 華曇 → | |
| 39.5-40.5' SAMPLE. | |
| Recovered 1.2/1.0' = 120%. | |
| CLAYSTONE: same as at | |
| sands and less iron staining | ; dry. |
| 110 + 40.5-41.5' SAMPLE. | |
| Recovered $1.2/1.0' = 120\%$. | |
| CLAYSTONE: olive black | (5 Y 2/1) to |
| dark gray (N 3/0); very fin | |
| careous sand in fractures | |
| yellowish brown (10 YR 5/ | |
| 7 41.2' band of caliche (or ca | ilcareous sand) |
| reacts strongly with HCl; | some organics; |
| T dry. | |
| 115 | |
| 41.5-42.5' SAMPLE. | |
| Recovered 1.5/1.0' = 150%. | 4 |
| CLAYSTONE: same as abov | e; ary. |
| 42.5-43.5' SAMPLE. | |
| Recovered $1.4/1.0' = 140\%$. | |
| CLAYSTONE: same as above | ve: drv. |
| | ,, |

| Location Rocky Flats Plant: Mound Area | Borehole/Wei | I No. <u>22-87BR</u> |
|--|-------------------|--|
| Coordinates N 36934.99 E 22715.72 | | ce Elevation 5930.70' |
| Total Depth 110.40' | | Encountered 12.2' |
| | | Static 5852.04' (12/01/87 |
| Drilling Company Boyles Bros | Oriller R. S | haro |
| Date Drilled Sept 30 & Oct 7-8, 1987 | Helper T. M | |
| Drilling Method Hollow Stem Auger; Rotary Core | | 0.0 - 45.1' None; 45.1' - 110.4' Water |
| Logged By K.D. Holliway; J.B. Bergman | Checked By | 45.1' - 110.4' Water |
| Geologist | Checked by | Site Manager |
| | • | CEARP Manager |
| Comments Surface casing set to 43.59' by K | .D. Holliway on | |
| Comments | | |
| | | |
| Lithologic Des | | |
| Lithologic Desc | cription | Samples Collected or Other Tests Performed |
| Lithologic Desc | | / 51 |
| | | |
| 45.1-49.50' SAMPLE. | | |
| \uparrow Recovered 3.7/4.5' = 82%. | | |
| RQD = $2.6/3.7' = 70\%$. 45.1-45.6': CLAYSTONE: | dark greenish | |
| gray (5 GY 4/1); dens | | |
| probably slough. | o, . or y or one, | |
| 45.6-47.4': SANDSTONE: | dark greenish | |
| † † † gray (5 GY 4/1); fir | | |
| sorted; some moderate br | | |
| iron stains; trace organics | | |
| at 46.5-46.7' filled with ir 47.4-49.5': CLAYSTONE: | | |
| $ \begin{array}{c} 47.4-49.5 \cdot CEATSTONE. \\ \text{gray (5 GY 4/1); dense} \end{array} $ | | |
| mogenous; dry to moist. | , no starits, no- | |
| | | |
| 49.5-52.5' SAMPLE. | | |
| + Recovered 2.7/3.0' = 90%. | | |
| RQD = 1.2/2.7' = 44%. | (7.37.3/3) | |
| CLAYSTONE: olive gray | | |
| fragments; consolidated; | | 1 |
| Tragments, vonsoridated, i | 110131. | |
| † † † <u>52.5-56.5' SAMPLE.</u> | | |
| Recovered $3.9/4.0' = 98\%$ |), | |
| \uparrow RQD = 3.9/3.9' = 100%. | | |
| CLAYSTONE: same as at | ove; moist. | · |
| 56 5 60 5' CANADI T | | |
| $\frac{-}{Recovered 3.8/4.0'} = 95\%.$ | | |
| RQD = 1.3/3.8' = 34%. | | |
| CLAYSTONE: dark gray | (N 3/0) to grav- | |
| + + ish black (N 2/0); den | ise; homogenous: | |
| some carbonaceous debris | | 1 |
| + + + | | 1 |
| | | |
| · + + + | | |

| Logged By K.D. Holling | es Bros Oct 7-8, 1987 Stem Auger; Rotary Core | Ground Surface Water Level Driller R. St. Heiper T. M. Drilling Fluid Checked By | 0.0 - 45.1' None; 45.1' - 110.4' Water Site Manager |
|------------------------|--|---|---|
| | Lithologic Descr | iption | Samples Collected or Other Tests Performed |
| | 60.5-64.5' SAMPLE. Recovered 3.6/4.0' = 90%. RQD = 3.6/3.6' = 100%. CLAYSTONE: dark gray (consolidated; homogenous; ceous debris; sandy from 6 to wet. 64.5-68.5' SAMPLE. Recovered 3.3/4.0' = 83%. RQD = 2.1/3.3' = 64%. 64.5-66.6': CLAYSTONE: sa 66.6-67.8': MUDSTONE: brown bro | me as above. ownish gray (5; "sulphur-like" abundant carments strongly ally slightly re- | |
| | RQD = 3.7/4.0' = 93%. CLAYSTONE: brownish blatrace very fine-grained sorganic fragments; moist to 72.5-76.5' SAMPLE. Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. CLAYSTONE: same as at fractures at 76.0' and 76.3 to wet. | and; abundant wet. | |

Location Rocky Flats Plant: Mound Area Borehole/Well No. 22-87BR N 36934.99 E 22715.72 Ground Surface Elevation 5930.70' Coordinates 110.40' Total Depth Water Level Encountered __12.2' Static 5852.04' (12/01/87) Drilling Company Boyles Bros Driller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt 0.0 - 45.1' None; 45.1' - 110.4' Water Drilling Method Hollow Stem Auger; Rotary Core Logged By K.D. Holliway; J.B. Bergman Checked By Geologist Site Manager CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987 • Samples Collected or Lithologic Description Other Tests Performed 76.5-80.5' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.6/4.0' = 90%. CLAYSTONE: same as above. TOTAL DEPTH OF HOLE: 78.50'; AD-JUST DEPTH. 78.5-82.5' SAMPLE. Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. 78.5-81.5': CLAYSTONE: same as above. 81.5-82.5': SANDSTONE: medium gray (N 5/0); well sorted; fine to very finegrained; rounded; some silt; some organics; consolidated; homogenous; moist. 82.5-86.5' SAMPLE. Recovered 4.0/4.0' = 100%. $RQD = 3.0/4.0^{\circ} = 75\%$. SANDSTONE: medium gray (N 5/0); fine to medium-grained; rounded; well sorted; consolidated; calcareous cementation from 86.3-86.5'-strongly reacts with HCl; some clay layers <1" thick present throughout; wet to moist.

of .

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| Coordinates N 3693. Total Depth 110.40' Drilling Company Boy Date Drilled Sept 30 Drilling Method Hollo Logged By K.D. Holl | 1es Bros 6 Oct 7-8, 1987 w Stem Auger; Rotary Core | Ground Surface Water Level Driller R. S Helper T. M | erritt 0.0 - 45.1' N 45.1' - 110.4 | 12.2' (12/01/87) one; |
|---|---|---|--|-----------------------------|
| Ge | ologist | • • | Site M | Manager |
| Comments Surface c | asing set to 43.59' by K. | O. Holliway on | October 2, 198 | 7 |
| | Lithologic Desci | iption | Samples Co Other Tests | pliected or Performed |
| | 86.5-90.5' SAMPLE. Recovered 2.6/4.0' = 65%. RQD = 1.3/2.6' = 50%. 86.5-87.1': SANDSTONE: gray (N 6/0); fine to mounded; well sorted; calcovery dense and consolidate 87.1-88.5': INTERBEDDED AND CLAYSTONE: samedium gray (N 5/0); 0. claystone layers medium 4/0); consolidated; moist. 88.5-89.1': CLAYSTONE: gray (N 4/0) with some v sandstone layers; same s moist. 90.5-95.0' SAMPLE. Recovered 4.0/4.5' = 89%. RQD = 3.3/4.0' = 83%. INTERBEDDED SANDST STONE: medium light gray stone and medium dark claystone; sandstone layers claystone layers 0.2-0.5' sandstone content with ded sands; moist to wet. | redium-grained; areous cement; d; dry. SANDSTONE adstone layers 5" to 2" thick; dark gray (N medium dark ery thin (<0.5') and as above; SONE/ CLAY-y (N 6/0) sand-gray (N 4/0) .05 to 1' thick; thick; decrease | | |

Borehole/Well No. 22-87BR Location Rocky Flats Plant: Mound Area Coordinates N 36934.99 E 22715.72 Ground Surface Elevation 5930.70' Total Depth 110.40' Water Level Encountered $\underline{12.2}$ Static <u>5852.04' (12/01/87)</u> Drilling Company Boyles Bros Driller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water Logged By K.D. Holliway; J.B. Bergman Checked By Site Manager Geologist CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987 (0,00) (0,00) / 6 Å Å / Samples Collected or Lithologic Description 95.0-99.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 2.8/4.0' = 70%. INTERBEDDED SANDSTONE/ CLAY-STONE: same as above with claystone layer from 97.3-98.7'; moist to wet. 99.0-103.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 1.3/2.0' = 65%.INTERBEDDED SANDSTONE/ CLAY-STONE: same as above with less sand content; layers are not distinct gradual changes; moist to wet. 102.0-107.0' SAMPLE. Recovered 5.0/5.0' = 100%. RQD = 5.0/5.0' = 100%.CLAYSTONE: medium dark gray (N 4/0); trace silt; trace carbonaceous fragments; homogenous; consolidated; dense; moist (picked up one foot of core from last run). 107.0-111.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.0/2.0' = 0%.CLAYSTONE: same as above; very broken: moist. TOTAL DEPTH: 110.40'

11

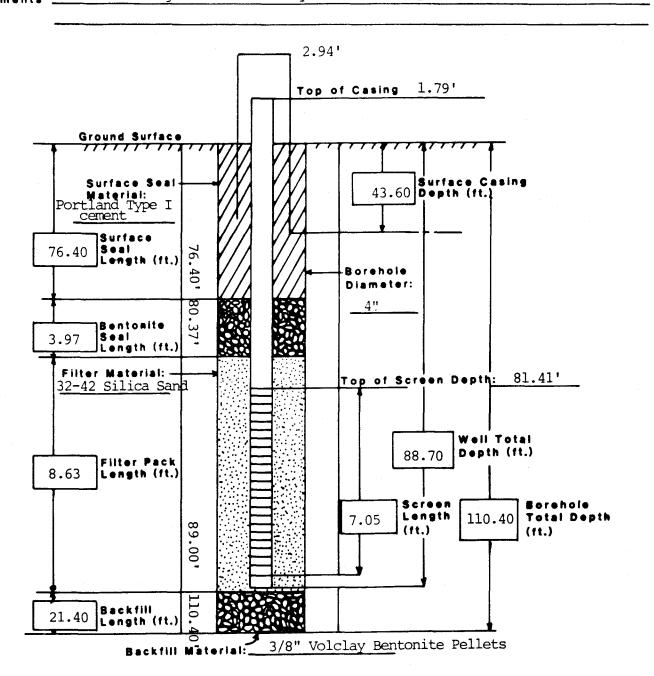
of_

WELL COMPLETION INFORMATION

22-87BR Location Rocky Flats Plant; Mound Area Well No. Elevation: Ground Surface 5930.70' Coordinates N 36934.99 E 22715.72 Total Depth: Well 88.70' Top of Casing ____5932.49' Borehole 110.40' Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel 2" ID Casing Diameter Screen Material 0.010" wire wrap. type 316 TFJ stainless steel Surface Casing Diameter Date Installed Oct. 10, 1987 Approved By K. D. Holliway Installed By __

Comments Surface casing set to 43.60' by K. D. Holliway October 9, 1987

Geologist



ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 45.60 - 52.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$

1ST P1/3 TEST

Q = INJECTION RATE = .00008688 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 6.95 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 49.07 + 11.15 + .00 * 2.31 = 60.22
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001233 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000002500 FT/MIN
K = .00000013 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 52.55 - 62.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = ----- LN(--)$$

2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.38 + 12.05 + .00 * 2.31 = 69.43
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000698 FT/MIN K = .00000004 CM/SEC

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000001353 FT/MIN<math>K = .00000007 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 62.20 - 71.85
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

K = ---- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000000123 FT/MIN
 K = .00000001 CM/SEC

P2/3 TEST

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 71.85 - 81.50

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

K = ---------- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 76.68 + 11.88 + .00 * 2.31 = 88.56

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000328 FT/MIN
 K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 76.68 + 7.50 + 13.50 * 2.31 = 115.36

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001261 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

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PACKER TEST ANALYSIS WELL NO. 22-87BR
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ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 81.50 - 91.15
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$

1ST P1/3 TEST

Q = INJECTION RATE = .00386629 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 78.66 + 11.12 + .00 * 2.31 = 89.78

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000288 FT/MIN K = .00000146 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00641485 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 16.05 * 2.31 = 123.24
R = BOREHOLE RADIUS = .17 FEET

2ND P1/3 TEST

Q = INJECTION RATE = .00275129 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 9.44 + .00 * 2.31 = 88.10
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000209 FT/MIN<math>K = .00000106 CM/SEC

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PACKER TEST ANALYSIS
 WELL NO. 22-87BR
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JOB NO. 2029-17-02 ROCKY FLATS PLANT; MOUND AREA DATE TESTED: 10/09/87 BY: J.B. BERGMAN TEST INTERVAL (FEET BELOW G.S.): 82.70 - 92.35 MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.):

Q K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00424278 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEETTEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

= 78.66 + 9.62 + .00 * 2.31 = 88.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000322 FT/MIN K = .00000163 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00561843 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEETTEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

78.66 + 7.50 + 16.50 * 2.31 = 124.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000303 FT/MIN K = .00000154 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00370700 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

= 78.66 + 10.45 + .00 * 2.31 = 89.11

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN K = .00000141 CM/SEC

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PACKER TEST ANALYSIS
  WELL NO. 22-87BR
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JOB NO. 2029-17-02 ROCKY FLATS PLANT; MOUND AREA DATE TESTED: 10/09/87 BY: J.B. BERGMAN TEST INTERVAL (FEET BELOW G.S.): 92.35 - 102.00 MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

Τ. K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00127428 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 10.95 + .00 * 2.31 = 89.61

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000095 FT/MIN K = .00000048 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00240376 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEETTEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

78.66 + 7.50 + 18.50 * 2.31 = 128.90

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN K = .00000063 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00085435 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS BELOW WATER TABLE HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 10.20 + .00 * 2.31 = 88.86

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000064 FT/MIN K = .00000033 CM/SEC

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Mound Area

Borehole Diameter: 0.333 22-87BR Well No :

Acrylic Tube Diameter: 0.16631

Static Water Level: 78.66'

Date of Water Level: 12/1/87_

Page 1 of 2

Comments: Test interval #5 failed on 2/3 pressure test and second 1/3 pressure test due to water gain in acrylic tube and test

intervals #6 and 7 failed on second 1/3 pressure test.

| Toet Interval No. | Top of Teet Interval | Bottom of Test Interval | Test Length (minutes) | Oses Pressure | Gage Height | Ave. H ₂ O Holent | Gege Height • Avg. H2O Height | Δħ | Date of Test | Libration | Geologist |
|----------------------|-------------------------|----------------------------|--------------------------|------------------|-------------|---------------------------------|-------------------------------------|-------|--------------|-----------|-----------|
| 1 | 92.35 | 102.00 | 15 | 0 | 7.50 | 3.45 | 10.95 | 0.88 | 10/09/87 | Kass | JBB |
| | | | 15 | 18.5 | 7.50 | N/A | 7.50 | 1.66 | 10/09/87 | Kass | JBB |
| | | - | 15 | 0 | 7.50 | 2.70 | 10.20 | 0.59 | 10/09/87 | Kass | JBB |
| 2 | 82.70 | 92.35 | 15 | 0 | 7.50 | 2.12 | 9.62 | 2.93 | 10/09/87 | Kass | JBB |
| | | | 15 | 16.5 | 7.50 | N/A | 7.50 | 3.88 | 10/09/87 | Kass | JBB |
| | | | 15 | 0 | 7.50 | 2.95 | 10.45 | 2.56 | 10/09/87 | Kass | JBB |
| ٠ | 81.50 | 91.15 | 15 | 0 | 7.50 | 3.62 | 11.12 | 2.67 | 10/09/87 | Kass | JBB |
| | | | 15 | 16.05 | 7.50 | N/A | 7.50 | 4.43 | 10/09/87 | Kass | JBB |
| | | | 15 | 0 | 7.50 | 1.94 | 9.44 | 1.90 | 10/09/87 | Kass | JBB |
| 7 | 71.85 | 81.50 | 15 | 0 | 7.50 | 4.38 | 11.88 | 0.03 | 10/09/87 | KCL | JBB |
| | | | 15 | 13.5 | 7.50 | N/A | 7.50 | 0.15 | 10/09/87 | KCL | JBB |
| | | | 15 | 0 | 7.50 | 5.37 | 12.87 | 00.0 | 10/09/87 | KCL | JBB |
| 5 | 62.20 | 71.85 | 15 | 0, | 6.70 | 4.91 | 11.61 | 0.01 | 10/12/87 | KCL | КДН |
| | | | 15 | 11.8 | 6.70 | N/A | 0. 9 | -0.03 | 10/12/87 | KCL | КОН |
| | | | 15 | 0 | 6.70 | 4.41 | 11.11 | -0.37 | 10/12/87 | KCL | КДН |
| 9 | 52.55 | 62.20 | 15 | 0 | 6.70 | 5.35 | 12.05 | 0.05 | 10/12/87 | KCL | КДН |
| | | | 15 | 9.5 | 6.70 | N/A | 6.70 | 0.12 | 10/12/87 | KCL | КДН |
| | | | 15 | 0 | 6.70 | 1.52 | 8.22 | -0.11 | 10/12/87 | KCL | КДН |
| | | | | | | | | | | | |

| | | - | | PACKE | KER TEST DOTA SHEET | DOTA SH | IEET | | | | |
|----------------------|--|----------------------------|--------------------------|-------|---------------------|--------------------------------|---|-------|--------------|------------------------------|-----------|
| Job No.: | 2029-17-02 | 2 | | | | | | | Static Wa | Static Water Level: 78.66" | 78.66 |
| Location: | Location: Rocky Flats Area; Mound Area | its Area; M | ound Area | 1 | | | | | Date of W | Date of Water Level: 12/1/87 | 12/1/87 |
| Well No.: | 22-87B | 22-87BR (CON'T) | | | | | | | Page 2 of | of 2 | |
| Borehole | Diameter: | 0.333' | | 3 | Comments: | | | | | | |
| Acrylic Tu | Acrylic Tube Diameter: | n: 0.1663' | | | | | | | | | |
| Teet Interval No. | Top of Teet Interval | Bottom of Test Interval | Test Length (minutes) | 7000 | Gage Height | Ave. H ₂ O Holgh | Gage Height +Avg. H ₂ O Height | 40 | Date of Teat | Libration | Geologiat |
| 7 | 45.60 | 52.55 | 15 | 0 | 6.70 | 4.45 | 11.15 | 90.0 | 10/12/87 | KCL | KDH |
| | | | 15 | 8.0 | 6.70 | N/A | 6.70 | 0.15 | 10/12/87 | KCL | КОН |
| | | | 15 | 0 | 6.70 | 2.86 | 9.56 | -0.44 | 1012/87 | KCL | КОН |
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12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft)

Water Level Elev. (ft)

** Well Number: 2287BR

12/01/87

80.45

5932.49

5852.04

INDEX OF DATA

| Boring | No.: 23-87BR |
|------------------------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> </u> | Log of Borehole |
| <u> </u> | Well Construction Summaries |
| مثبت أن جمعت التعريبية | Well Development Summaries |
| <u> </u> | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| X | Water Level Data |

Location Rocky Flats Plant: Mound Area Borehole/Well No. __23-87BR Ground Surface Elevation ___ 5972.34' Coordinates N 36415.15 E 22802.78 Total Depth __45.30' Water Level Encountered 19.0' Static 5958.39' (12/01/87) Drilling Company Boyles Bros Driller _D. Jarvie_ Date Drilled July 17-21, 1987 Heiper _J. Duncan Drilling Method Hollow Stem Auger Drilling Fluid _None Logged By S. Rogal; K.D. Holliway Checked By Geologist CEARP Manager Comments -/ \$ \ \ = ,0, Samples Collected or Lithologic Description Other Tests Performed HNu Background=2.0 ROCKY FLATS ALLUVIUM OVA Background=3.0 Ludlum Background 0.0-2.0' SAMPLE. = 0.0Recovered 1.5/2.0' = 75%. 0-1.0': SAND: dusky brown (5 YR 2/2); fine-grained; some grass; dry. 1.0-1.5': SILTY SAND: dusky yellow (5 Y 0-2.0': No readings 6/4); some gravel; dry. over background on core. 2.0-4.0' SAMPLE. Recovered 1.4/2.0' = 70%. 2.0-4.0': Readings on SAND: dusky yellow (5 Y 6/4); finegrained; some gravel and cobbles; iron core: HNu = 3.0; OVA = 5.0.discoloration; dry. 4.0-5.0' SAMPLE. Recovered 0.9/1.0' = 90%. 4.0-5.0': Readings on core: HNu = 5.0; GRAVEL AND SAND: same as above: 10 OVA = 7.0. dry. 5.0-7.0' SAMPLE. 5.0-7.0': Readings on Recovered 0.4/2.0' = 20%. core: HNu = 5.0; GRAVEL AND SAND: light olive brown OVA = 6.0.(5 Y 5/6); trace silt; dry. 7.0-9.0' SAMPLE. 7.0-9.0': Readings on Recovered 1.7/2.0' = 85%. GRAVEL AND SAND: same as above; core: HNu = 2.0; <u>15</u> OVA = 5.0.dry. 9.0-11.0' SAMPLE. 9.0-11.0': No readings Recovered 0.6/2.0' = 30%. GRAVEL AND SAND: same as above; over background on core. dry.

of __

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| Location Rocky Flats Coordinates N 36415 Total Depth 45.30' Drilling Company Bor Date Drilled July 17- Drilling Method Hollor Logged By S. Rogal | .15 E 22802.78 Ground Surfac Water Level yles Bros Driller D. J. -21, 1987 Helper J. D y Stem Auger Drilling Fluid | None / |
|---|---|--|
| Comments | | CEARP Manager |
| 20 | Lithologic Description | Samples Collected or Other Tests Performed |
| 25 | 11.0-13.0' SAMPLE. Recovered 0.43/2.0=20%. GRAVEL AND SILT: moderate reddish brown (10 R 4/6); trace fine-grained sand; cobble stuck in shoe of barrel; damp. 13.0-15.0' SAMPLE. Recovered 1.7/2.0' = 85%. GRAVEL AND SILT: same as above with iron and limonite staining; damp. 15.0-17.0' SAMPLE. Recovered 1.98/2.0' = 99%. 15.0-15.25': GRAVEL AND SILT: same as above; damp. ARAPAHOE FORMATION | 11.0-13.0': Readings on core: HNu = 5.0; OVA = 4.0. 13.0-15.0': Readings on core: HNu = 3.0; OVA = 5.0. 15.0-17.0': Readings on core: HNu = 2.0; OVA = 5.0. 17.0-19.0': Readings on core: HNu = 5.0; OVA = 5.0. |
| 35. | 15.25-17.0': SANDSTONE: dusky yellow (5 Y 6/4); fine-grained; well sorted; iron staining; weathered; damp. 17.0-19.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDSTONE: same as above; moist. 19.0-21.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDSTONE: same as above; wet. | 19.0-21.0': Readings on core: HNu = 3.0; OVA = 5.0. 21.0-23.0': Readings on core: HNu = 3.0; OVA = 5.0. 23.0-25.0': Readings on core: HNu = 3.0; |
| 40 | 21.0-23.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDSTONE: same as above; moist. | OVA = 5.0. 25.0-27.0': Readings on core: HNu = 3.0; OVA = 5.0. |

| Coordinates N 36415.15 E 22802.78 Total Depth 45.30' Drilling Company Boyles Bros Date Drilled July 17-21, 1987 Drilling Method Hollow Stem Auger Logged By S. Rogal; K.D. Holliway Geologist | Borehole/Well No. 23-87BR Ground Surface Elevation 5972.34' Water Level Encountered 19.0' Static 5958.39' (12/01/8 Driller D. Jarvie Helper J. Duncan Drilling Fluid None Checked By Site Manager |
|---|--|
| Lithologic Des | Samples Collected or Other Tests Performed |
| 23.0-25.0' SAMPLE. Recovered 2.0/2.0' = 1000 SANDSTONE: olive gray tled; weathered; wet. 25.0-27.0' SAMPLE. Recovered 2.0/2.0' = 1000 SANDSTONE: same as all 27.0-29.0' SAMPLE. Recovered 1.9/2.0' = 1000 SANDSTONE: same as all 29.0-31.0' SAMPLE. Recovered 2.0/2.0' = 1000 SANDSTONE: olive gray silt; mottled; weathered damp; 30.3-31' wet. 31.0-33.0' SAMPLE. Recovered 2.0/2.0' = 1000 SANDSTONE: same as gray clay lenses at 31.8', 31.4-33.4' SAMPLE. Recovered 2.0/2.0' = 1000 SANDSTONE: dark yell YR 6/6) to dusky yellow phi sand, well sorted; ilight olive gray (5 Y fairly well sorted; wet to 33.4-35.0' SAMPLE. No swith center bit. | OVA = 5.0. 29.0-31.0': Readings on core: HNu = 3.0; OVA = 5.0. 31.0-33.0': Readings on core: HNu = 3.0; OVA = 5.0. 31.0-33.0': Readings on core: HNu = 3.0; OVA = 5.0. %. OVA = 5.0. 31.0-33.0': Readings on core: HNu = 3.0; OVA = 5.0. %. OVA = 5.0. 31.0-33.0': Readings on core: HNu = 3.0; OVA = 5.0. %. OVA = 5.0. 31.0-33.0': Readings on core: HNu = 3.0; OVA = 5.0. %. OVA = 5.0. |

| | 15 E 22802.78 Gro Wat 1es Bros 21, 1987 Hell Stem Auger | er Level Encou | ntered |
|----------|--|--|--|
| Comments | | | |
| | Lithologic Descriptio | , , , - | amples Collected or her Tests Performed |
| | 35.0-36.0' SAMPLE. Recovered 1.0/1.0' = 100%. SANDSTONE: dark yellowish of YR 6/6) to dusky yellow (5 Y 3.5-4.0 phi, well sorted; trace classing trace of the second secon | 6/4); sand y; wet. et. gray (5 Y some clay; as above; | |
| | 40.3-41.3' SAMPLE. Recovered 1.0/1.0' = 100%. 40.3-40.8': CLAYSTONE: olive 4/1) trace silt; trace 3.5-4.0 phi weathered; slightly moist to dam 40.8-41.3': SILTSTONE: olive g 4/1); some very fine-grained s clay; unweathered; damp to dry. | sand; un- np. gray (5 Y and; some | |

| Location | Rocky Fla | ts Plant: Mound Area | . Borehole/We | II No. <u>23-87BR</u> |
|------------|--------------------|--|----------------------|----------------------------|
| Coordina | N 364 | 15.15 E 22802.78 | Ground Surfa | ace Elevation5972.34' |
| Total De | pth45.30 | 0' | | Encountered 19.0' |
| | | | | Static 5958.39' (12/01/87) |
| Drilling (| Company F | Boyles Bros | Briller B | |
| | | | | Jarvie |
| | | 17-21, 1987 | Helper | Duncan |
| Drilling & | dethod <u>Holl</u> | ow Stem Auger | Drilling Fluid | None |
| Logged | | al; K.D. Holliway | Checked By | - Allando |
| | • | Geologist | · | Site Manager |
| | | | | |
| Comment | | | | CEARP Manager |
| Commen | - | | | |
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| , | 1. | 7. 7 | | 7 |
| / | | / ~ . / | | Samples Collected or |
| | | E.a. Lithologic | Description | Other Tests Performed |
| | /0 /0 | Lithologic | | |
| _ | | | | |
| | 1 1 | 41.3-42.3' SAMPLE. | 00/ | |
| | I | Recovered 0/1.0' = 0 SILTSTONE: same as | | 1 |
| | + + | + SILISTONE. same as | s above, dry. | 1 |
| | | 42.3-43.3' SAMPLE. | | 1 |
| | + + | Recovered $1.0/1.0$ ' = | 100% | |
| | | | as above; trace very | |
| | † † | fine-grained sand; di | | |
| | 1 1 | 1 | • | 1 |
| | T | 43.3-44.3' SAMPLE. | | |
| | + + | $\downarrow \text{Recovered } 1.0/1.0' =$ | | |
| | | SILTSTONE: same as | s above; dry. | |
| | † † | 44.3-45.3' SAMPLE. | | |
| | | Recovered $1.0/1.0' =$ | 100% | |
| | † † | | is above except more | |
| | 1 1 | sand; dry. | is above except more | |
| | I | 1 | | |
| | + + | + TOTAL DEPTH: 45 | .30' | |
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WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Mound Area 23-87BR Well No. Coordinates N 36415.15 E 22802.78 Elevation: Ground Surface _5972.34' Total Depth: Well 37.85' Top of Casing ____ 5974.49' Borehole 45.30' Arapahoe Formation Formation of Completion Casing Material Sch 5. type 316 TFJ stainless steel Casing Diameter 2" ID Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter stainless steel Date installed July 24, 1987 Approved By Installed By K.D. Holliway Geologist CEARP Manager Comments

2.90' Top of Casing 2.15' Ground Surface Surface Casing Surface Seal 2.10 Dopth (ft.) Material: Portland Type I cement Surface 14.0 Seal Longth (ft.) Borehole Diameter: 0 7.5" Ò Sentonite Seal 2.25 Longth (ft.) Filter Material: Top of Screen Depth: 17.19' 32-42 Silica Sand Well Total Depth (ft.) 37.85 Filter Pack 21.60 Length (ft.) Borchole 20.42 Length 45.30 **Total Depth** (ft.) Backfill 7.45 Longth (ft.) 3/8" Volclay Bentonite Pellets

Backfill Material:

PROGRAM SLUGT, VERSION 4,0CT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3, NO. 1 OF MRR ENTITLED
 - *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTAMEDUS CHARGE OF WATER*)
- (2) METHOD OF BOUNER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 DF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 23-87 BR

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DRILLED HOLE = 7.50 INCHES
ESTIMATED POROSITY OF GRAVEL PACK = .25

LENGTH OF SCREEN OR INTAKE PORTION = 21.13 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 21.13 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 16.52 FEET
FALLING-HEAD INDEX = 0 (*1° IF FALLING.*0° IF RISING)

NUMBER OF HEAD-TIME DATA POINTS = 54

HEAD

TIME

| IINE | | מאשח |
|-------|----|-------|
| (sec |) | (FEET |
| 1.00 |) | 1.330 |
| 2.00 | ł | 1.300 |
| 3.00 | i | 1.290 |
| 4.00 | • | 1.280 |
| 5.00 | į. | 1.270 |
| 6.00 | i | 1.260 |
| 7.00 | į | 1.250 |
| 8.00 | i | 1.240 |
| 9.00 | ł | 1.230 |
| 10.00 |) | 1.230 |
| 11.00 | į | 1.220 |
| 12.00 | | 1,210 |
| 13.00 | | 1.210 |
| 14.00 | | 1.200 |
| 17.00 | | 1.180 |
| 20.00 | | 1.160 |
| 23.00 | | 1.140 |
| 26.00 | | 1.130 |
| 29.00 | | 1.110 |
| 32.00 | | 1.090 |
| 35.00 | | 1.080 |
| 38.00 | | 1.060 |
| 41.00 | | 1.050 |
| 44.00 | | 1.050 |
| 47.00 | | 1.030 |
| 50.00 | i | 1.000 |

| 53.00 | . 980 |
|---------|-------|
| 56.00 | . 970 |
| 59.00 | .950 |
| 62.00 | . 940 |
| 68.00 | .910 |
| 77.00 | . 880 |
| 86.00 | .850 |
| 95.00 | .810 |
| 104.00 | .780 |
| 113.00 | .760 |
| 122.00 | .730 |
| 152.00 | . 660 |
| 182.00 | .600 |
| 224.00 | .530 |
| 284.00 | . 450 |
| 344.00 | . 390 |
| 404.00 | . 330 |
| 464.00 | . 290 |
| 524.00 | . 250 |
| 584.00 | . 220 |
| 644.00 | . 200 |
| 704.00 | . 180 |
| 764.00 | . 160 |
| 854.00 | .130 |
| 974.00 | .110 |
| 1094.00 | .100 |
| 1274.00 | . 080 |
| 1577.00 | .070 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

> 1.1004 1.1322

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 5.76E-06 FT/sec = 1.76E-04 CM/sec

TRANSMISSIVITY = 9.52E-05 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.82E-06 FT/sec = 5.54E-05 CM/sec

TRANSMISSIVITY = 3.00E-05 FT##2/sec

12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft) Water Level Elev. (ft)

** Well Number: 2387BR

12/01/87

16.10

5974.49

5958.39

INDEX OF DATA

| Boring No.: 24-87 | | |
|-------------------|----------------------------------|--|
| Comple | ted as well? Yes | |
| Data in | File | |
| <u> </u> | Log of Borehole | |
| <u> </u> | Well Construction Summaries | |
| | Well Development Summaries | |
| | Hydraulic Conductivity Test Data | |
| | and Results | |
| | Packer Test Data and Results | |
| X | Water Level Data | |

| Location | Rocky Flats Plant; East Trenches Area Borehole/Well | No. <u>24-87</u> |
|------------|--|--|
| Coordinat | • N 36759.05 E 23640.05 Ground Surfac | • Elevation <u>5957.79'</u> |
| Total Dep | th 18.60' Water Level I | Encountered None |
| | | Static 5944.74' (12/01/87) |
| Drilling C | ompany <u>Boyles Bros</u> Driller <u>R. Sh</u> | |
| | ed September 2, 1987 Helper S. Br | |
| | | |
| _ | | |
| roddeg R | y J.B. Bergman Checked By Checked By | Sive Manager |
| | declogist | Drant Hours |
| | 7 | CEARP Manager |
| Comment | | |
| | | |
| | | |
| | Lithologic Description | Samples Collected or Other Tests Performed |
| | 4/6~/62/ | |
| 0 | Trape 1 | |
| | ROCKY FLATS ALLUVIUM | HNu Background=0.4 |
| | 0.0-2.0' SAMPLE. | OVA Background=0.0 |
| | Recovered $1.3/2.0' = 65\%$. | No Ludlum readings taken. |
| | CLAY AND GRAVEL: grayish brown (5 | taren. |
| | YR 3/2); abundant quartzite gravels; an- | 4.0': Readings at well |
| | gular to subrounded; poorly sorted; roots | head: HNu = 0.2; |
| | and grasses common; slightly consoli- | OVA = 6. |
| 5 | dated; dry. | 70 P 11 |
| | 2.0-4.0' SAMPLE. | 7.3': Readings at well head: HNu = 1.0; |
| | Recovered $1.3/2.0' = 65\%$. | OVA = 2.0. |
| | SANDY CLAY AND GRAVEL: grayish | Readings in |
| | brown (5 YR 3/2); sandy matrix; some | breathing zone: HNu |
| | quartzite gravels; some clay; very fine- | = 0.2; OVA $= 6$. |
| | grained sand; unsorted; angular to sub- | |
| | rounded; caliche in shoe at ~3.1'; uncon- solidated; slightly damp. | |
| 10 | 1000 at 2 | |
| | 4.0-6.0' SAMPLE. | |
| | Recovered $1.0/2.0' = 50\%$. | |
| | SANDY CLAY AND GRAVEL: moderate | |
| | yellowish brown (10 YR 5/4) clay; very | |
| | fine-grained sand; some clay; some silt; poorly sorted; angular to subrounded; | |
| | abundant caliche; reacts with HCl; uncon- | |
| | solidated; slightly damp. | |
| .15 | | |
| | 6.0-7.3' SAMPLE. | |
| | Recovered $1.3/1.3' = 100\%$. | • |
| | SANDY CLAY AND GRAVEL: same as | . 1 |
| | above but more clay and less gravel; peb- | |
| | bles in shoe; unconsolidated; slightly damp. | Ì |
| | | 1 |
| | + + + | |

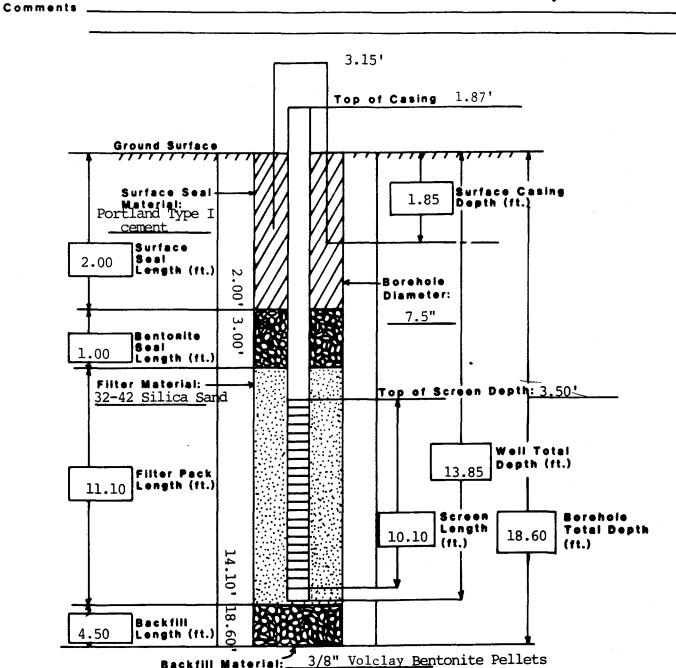
| Location Rocky Flat | s Plant; East Trenches Area Borehole/W | ell No. 24-87 |
|---------------------|---|---|
| Coordinates N 367 | | face Elevation 5957.79' |
| Total Depth 18.60 | | I Encountered None |
| | | Static 5944.74' (12/01/87 |
| Drilling Company Bo | oyles Bros Driller R. | |
| Date Drilled Septer | mber 2, 1987 Helper S. | Bradfield |
| Drilling Method Hol | low Stem Auger Drilling Flu | None None |
| Logged By J.B. Be | ergman Checked By | Adjascha |
| | Geologist | Site Manager |
| | | CEARP Manager |
| Comments | | |
| | Lithologic Description | Samples Collected or Other Tests Performed |
| | 72.02.541/0/ 5 | |
| + + | $\frac{7.3-9.3' \text{ SAMPLE.}}{\text{Recovered } 1.2/2.0' = 60\%.}$ | 1 |
| | CLAY AND GRAVEL: moderate brow | |
| † † | (5 YR 4/4); abundant quartzite grave | |
| 1 1 | and pebbles; angular to subrounded; tra | |
| ł | slightly damp. | su, |
| † † | † | |
| _ + + | 9.3-10.1' SAMPLE. | |
| | Recovered 0.8/0.8' = 100%. CLAY AND GRAVEL: same as above | , a. |
| † † | dry to slightly damp. | , , , |
| + + | + | |
| | 10.1-11.1': No recovery. Drilled wi | th |
| † † | center bit. | 1 |
| 1 1 | 11.1-13.1' SAMPLE. | |
| | Recovered $1.0/2.0' = 50\%$. | |
| - † † | CLAY AND GRAVEL: same as above; caliche; dry to slightly damp. | no |
| 1 1 | tarione, dry to slightly damp. | |
| | 13.1-15.1' SAMPLE. | 1 |
| TT | Recovered 2.0/2.0' = 100%. | |
| + + | 13.1-13.4': CLAY AND GRAVEL: same above. | as |
| | | |
| † † | ARAPAHOE FORMATION | |
| - + + | 13.4-15.1': CLAYSTONE: light olive gr | 2. |
| 1 1 | (5 Y 6/1); abundant dark yellowi | |
| 1 1 | orange (10 YR 6/6) mottles; sandy; ve | ry |
| + + | fine-grained; silty; rounded; consolidate | |
| 1 1 | weathered; trace caliche; increase in cleaning with depth; dry. | ay |
| ŢŢ | T and dopin, dry. | } |
| + + | + | 1 |
| | | |
| | • | Page of3 |

| Location Rocky Fla | ts Plant; East Trenches | Area Borehole/Wel | II No. <u>24-87</u> |
|--------------------|---|--------------------|---|
| Coordinates N 36 | 759.05 E 23640.05 | Ground Surfa | ce Elevation 5957.79' |
| Total Depth18.6 | 0' | | Encountered None |
| | | | Static 5944.74' (12/01/8 |
| Drilling Company | Boyles Bros | Driller R. S | |
| | ember 2, 1987 | Helper S. B | |
| | llow Stem Auger | Drilling Fluid | |
| Logged By J.B. | | _ | |
| | Geologist | Checked By | Site Manager |
| Comments | | | CEARP Manager |
| | | | |
| | Lithologic D | •scription | Samples Collected or Other Tests Performed |
| | | | |
| + + | 15.1-17.1' SAMPLE. | F04 | 1 |
| | Recovered 1.7/2.0' = 8 CLAYSTONE: same a | | 1 |
| † † | T CEATSTONE. Same a | .s a00 vc. | |
| 1 1 | 17.1-19.1' SAMPLE. | | 1 |
| TT | Recovered 1.2/2.0' = 60 | | |
| + + | SANDY CLAYSTON | | |
| | orange (10 YR 6/6) c | | |
| - + + | dant light brown (5 | | |
| 1 1 | shoe (FeO stains); dry. | | |
| | (200 012110), 213. | | |
| + + | TOTAL DEPTH WITH | H PLOPPER = 18.6'. | |
| _ | ADJUST DEPTH. | | ì |
| † † | TOTAL DEPTH 10 C | 01 | |
| 1 1 | TOTAL DEPTH: 18.60 | U. | |
| | | | |
| - + + | † | | |
| 1 1 | 1 | | 1 |
| TI | | | |
| + + | + | | |
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| † † | T | | 1 |
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| ŢŢ | T | | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; East Trenches Area Well No. 24-87 Coordinates N 36759.05 E 23640.05 Elevation: Ground Surface 5957.79' Total Depth: Well 13.85' Borehole 18.60' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless Casing Diameter 2" ID Screen Material 0.010" wire wrap, type 316 TFJ

Date installed Sept. 2, 1987 stainless steel Surface Casing Djameter Approved By Installed By J. B. Bergman e Wanager Geologist



12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 2487

12/01/87

14.92

5959.66

5944.74

INDEX OF DATA

| Boring | No.: 25-87BR |
|-----------|----------------------------------|
| Comple | eted as well? Yes |
| Data ir | File |
| <u> X</u> | Log of Borehole |
| <u> X</u> | Well Construction Summaries |
| | Well Development Summaries |
| <u> </u> | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| X_ | Water Level Data |

| Location | Rocky Flats Plant: East Trenches | Area Borehole/Well | No. 25-87BR |
|---------------|---|-----------------------|-----------------------------|
| Coordina | N 36727.08 E 23641.38 | Ground Surfac | • Elevation <u>5958.91'</u> |
| Total Dep | oth 47.00' | Water Level | Encountered 15.50' |
| | | | Static 5937.01' (12/01/87 |
| Drilling C | ompany Boyles Bros | Driller R. Sh | arp. |
| | Med August 11-14, 1987 | Helper S. Br | • |
| | ethod Hollow Stem Auger | Drilling Fluid | |
| | R. T. Treat | | |
| | Geologist | Checked By | Site Manager |
| | | _ | Dant Benis |
| | | | ØEARP Manager |
| Comment | \$ | | |
| | | | |
| | \(\sigma \sigma \sigma \) | | |
| | Lithologic [| | Samples Collected or |
| /0 | Lithologic E | Description | Other Tests Performed |
| 0 | | | |
| | TOPS | SOIL | HNu Background=1.0 |
| | To a contract of the contract | | OVA Background=0.0 |
| | 0.0-2.2' SAMPLE. | | No readings over |
| | Recovered $1.8/2.2' = 8$ | | background on core. |
| | 0.0-0.3': TOP SOIL: 0 | | |
| | 2/2); clayey quartz slightly damp. | ite graveis; sandy; | |
| | slightly damp. | | l · |
| _5 | ROCKY FLAT | S ALLUVIUM | |
| - | | <u> </u> | 1 |
| | 0.3-1.8': CLAY AND | | |
| | brown (5 YR 3/4); | • | |
| | | cobbles; slightly | |
| | calcareous; dry. | | 1 |
| | 2.2-5.5' SAMPLE. | | |
| | Recovered $1.7/3.3' = 5$ | 52%. | |
| 1.0 | 2.2-2.7': CLAY: grayis | | |
| 10 | slightly sandy with so | | ľ |
| | 2.7-3.9': SAND AN | • | · |
| | brown (5 YR 6/4); an | | |
| | gravel; fine-grained damp. | sand; dry to slightly | |
| | uamp. | | |
| | 5.5-7.5' SAMPLE. | | |
| | Recovered $2.0/2.0' = 1$ | | |
| - | CLAYEY SAND AN | • • | ! |
| 15 | orange pink (5 YR 7/ | | |
| | medium-grained sar subrounded; poorly so | | |
| | subrounded, poorty so | orted, carrene, dry. | |
| | | | |
| | | |] |
| | + + + | | |
| | | | |
| | | | |
| 20 | | | |

Page __1 __ of __6

| Location Rocky Flats Coordinates N 36727. Total Depth 47.00' Drilling Company Boy Date Drilled August 1 Drilling Method Hollow Logged By R. T. Tre | 08 E 23641.38 les Bros 1-14. 1987 Stem Auger | Ground Surface Water Level | Encountered 15.50' Static 5937.01' (12/01/87) harp radfield None |
|--|--|---|--|
| Comments | •/ | | Samples Collected or |
| 20 | Lithologic D | escription | Other Tests Performed |
| 25 | 7.5-9.5' SAMPLE. Recovered 1.4/2.0' = 70 CLAYEY SAND AN brown (5 YR 6/4) to 5/2); subangular to medium-grained sand some caliche; scattered rounded gravel; dry. 9.5-10.5' SAMPLE. Recovered 0.5/1.0' = 50 CLAYEY SAND: yell 7/2); fine-grained san | D GRAVEL: light pale brown (5 YR subrounded gravel; is; poorly sorted; subangular to sub- | |
| 30. | tered gravels; poorly so 10.5-12.5' SAMPLE. Recovered 1.0/2.0' = 50 SAND AND GRAVEI YR 3/2) to pale broclayey; subangular to fine to medium-grain sorted; moderately of damp to moist. | 0%. L: grayish brown (5 own (5 YR 5/2); subrounded gravels; ined sand; poorly | |
| 35 | 12.5-14.5' SAMPLE. Recovered 1.6/2.0' = 80 SAND AND GRAVE damp. | | |
| | | | |

| Coordinates Total Depth Drilling Comp Date Drilled Drilling Metho | N 36727.08 E 23641.38 47.00' Boyles Bros August 11-14. 1987 Hollow Stem Auger R. T. Treat Geologist | Ground Surfac Water Level | • Elevation _5958.91' Encountered _15.50' Static _5937.01' (12/01/8 arp adfield _None |
|---|---|---|---|
| 40 | Lithologic D | escription | Samples Collected or Other Tests Performed |
| 45 | 14.5-16.5' SAMPLE. Recovered 1.6/2.0' = 80 14.5-15.8': SAND AN brown (5 YR 5/2); rounded gravel; fine sand; poorly sorted; da 15.8-16.0': SANDY brown (5 YR 3/4); son grained sands; poorly moist. ARAPAHOE FO | D GRAVEL: pale subangular to subto medium-grained mp. CLAY: moderate ne gravels; medium-y sorted; damp to | |
| <u>50</u> | 16.5-18.5' SAMPLE. Recovered 2.0/2.0' = 10 CLAYEY SANDSTON (5 Y 5/2); fine-grained ing; calcareous; damp to | 00%. E: light olive gray d sands; FeO stain- | |
| + | 18.5-19.5' SAMPLE. Recovered 1.0/1.0' = 10 CLAYEY SANDSTON (5 Y 5/2) to dark ye YR 6/6) in a highly 19.3-19.5'; poorly sorted 19.5-21.0': No recove center bit. | E: light olive gray cllowish orange (10 cemented zone at d; damp to dry. | |
| + | 21.0-23.0' SAMPLE. Recovered 2.0/2.0' = 10 CLAYEY SANDSTON (10 YR 7/4) to pale y YR 6/2); thinly lamina grained sand; poorly mented; moist. | E: grayish orange ellowish brown (10 ted clay beds; fine- | |

| Coordinates N 3 Total Depth 47. Drilling Company Date Drilled Aug Drilling Method H | Boyles Bros Driller R. | Static Sharp Bradfield None |
|--|--|---|
| | Lithologic Description | Samples Collected or Other Tests Performed |
| | 23.0-24.0' SAMPLE. Recovered 1.0/1.0' = 100%. SANDSTONE: grayish orange (10 Y 7/4); highly weathered; weakly cemente poorly sorted; wet. 24.0-26.0' SAMPLE. No recovery. SANDSTONE: same as above. | |
| — † ; | 26.0-28.0' SAMPLE. Recovered 0.8/2.0' = 40%. SANDSTONE: grayish orange (10 Y 7/4); weathered; poorly sorted; weak cemented; medium-grained; severely oxid stained; wet. | ly |
| _ | 28.0-30.0' SAMPLE. Recovered 1.3/2.0' = 65%. SANDSTONE: light bluish gray (5 B 7/to grayish orange (10 YR 7/4); massive bedding; weakly cemented; medium grained; highly weathered; moist. | ve |
| † | 30.0-32.0' SAMPLE. Recovered 0.4/2.0' = 20%. SANDSTONE: same as above; moist. | |
| - + - | 32.0-33.0' SAMPLE. Recovered 1.0/1.0' = 100%. SANDSTONE: dark yellowish orange (YR 6/6) to grayish orange (10 YR 7/4 | |

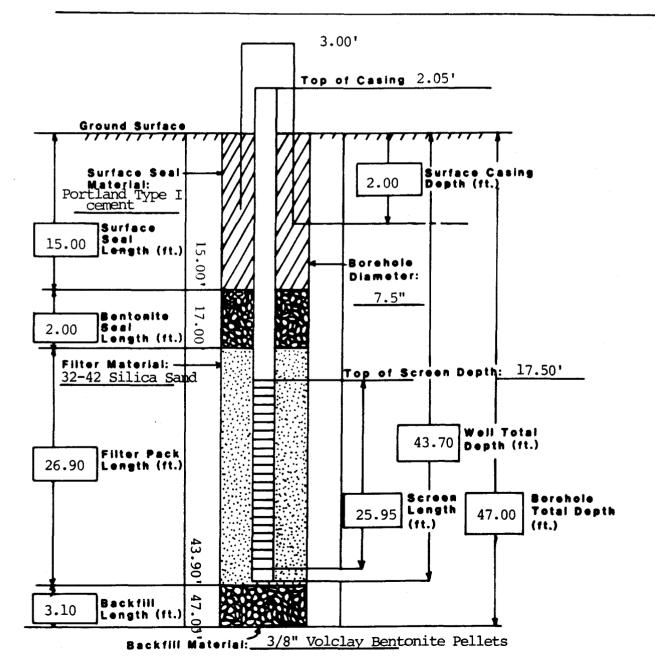
| Total Depth 47.00' Water Level | Encountered 15.50' Static |
|--|---|
| | harp radfield |
| Drilling Method Hollow Stem Auger Drilling Fluid Logged By R. T. Treat Checked By Geologist | None |
| Comments | |
| Lithologic Description | Samples Collected or Other Tests Performed |
| 33.0-35.0' SAMPLE. Recovered 0.5/2.0' = 25%. SANDSTONE: dark yellowish orange (10 YR 6/6); medium-grained sand; subrounded; poorly sorted; weakly cemented; moist. 35.0-36.0' SAMPLE. Recovered 0.3/1.0' = 30%. SANDSTONE: same as above; moist. 36.0-37.5' SAMPLE. No recovery. 37.5-38.0' SAMPLE. Recovered 0.2/0.5' = 40%. SANDSTONE: yellowish gray (5 Y 7/2); medium-grained sand; subrounded to subangular; weakly cemented; poorly sorted; moist. 38.0-39.0' SAMPLE. No recovery. SANDSTONE: same as above. 39.0-40.7' SAMPLE. No recovery. 40.7-42.7' SAMPLE. No recovery. 40.7-42.7' SAMPLE. Recovered 0.1/2.0' = 5%. SANDSTONE: grayish orange (10 YR 7/4); thin laminated clay; fine-grained sands; poorly sorted; moderately cemented; moist. | |
| | Page _ 5 _ of _ 6 |

| Coordinates N 36727.08 E 23641.38 Total Depth 47.00' Drilling Company Boyles Bros Date Drilled August 11-14. 1987 Drilling Method Hollow Stem Auger Logged By R. T. Treat Geologist | | e Elevation Encountered Static arp adfield None Site | 5958.91' 15.50' |
|--|---|--|--------------------|
| Comments Lithologic Desc | cription | Samples Other Tes | • |
| 42.7-44.7' SAMPLE. Recovered 0.5/2.0' = 25%. 42.7-43.2': SANDSTONE: 43.2-44.7': SANDY CLAY ish gray (5 Y 7/2) to ligh 5/2); massive; fine-graine plastic; moist. 44.7-46.7' SAMPLE. | same as above. YSTONE: yellow- it olive gray (5 Y | | |
| Recovered 1.0/2.0' = 50%. SANDY CLAYSTONE: In 5/0) to grayish orange blocky; fine-grained sand moderately cemented; stained; moist to damp. 46.7-47.0' SAMPLE. | medium gray (N e (10 YR 7/4); d; poorly sorted; | | |
| Recovered 0.3/0.3' = 100% CLAYSTONE: dark gree 4/1) slightly sandy; fine ately cemented; damp. TOTAL DEPTH: 47.0' | enish gray (5 G | | |
| | | · | |
| | | | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; East Trenches Area Well No. 25-87BR E 23641.38 Coordinates N 36727.08 Elevation: Ground Surface 5958.91' Total Depth: Well 43.70' Top of Casing ___ 5960.96' Borchole 47.00' Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless Casing Diameter ____2" ID Screen Material 0.010" wire wrap, type 316 TFJ

Data lactalist Aug. 17, 1997 stainless steel Surface Casing Diameter Date installed Aug. 17, 1987 Approved By _ Installed By R. T. Treat Geologist Comments .



- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3.NO.1 OF MRR ENTITLED
 - *RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER*)

THIS FROGRAM CALCULATES REAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON THO ANALYTICAL APPROACHES:

(2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED
"A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS
WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LIDATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-14-87

FIEL: INVESTIGATOR: Kevin McNeill

WELL NO.: 25-87 BR

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DEPTH

DIAMETER OF DRILLED HOLE = 7.50 INCHES

ESTIMATED POROSITY OF GRAVEL PACK = .25

NUMBER OF HEAD-TIME DATA POINTS = 42

LENGTH OF SCREEN OR INTAKE PORTION = 20.80 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 20.80 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 20.55 FEET
FALLING-HEAD INDEX = 0 ("1" IF FALLING,"0" IF RISING)

| TIME | HEAD |
|----------------|--------------|
| (sec) | (FEET) |
| | |
| 1.00 | 1.140 |
| 2.00 | 1.090 |
| 3.00 | 1.050 |
| 4.00 | 1.010 |
| 5.00 | ,970 |
| 6.00 | . 940 |
| 7.00 | .900 |
| 8.00 | .870 |
| 9.00 | .840 |
| 10.00 | .810 |
| 11.00 | .780 |
| 12.00 | .760 |
| 13.00 | .730 |
| 14.00 | .700 |
| 15.00 16.00 | .680 .560 |
| 17.00 | .640 |
| 18.00 | .610 |
| 19.00 | .600 |
| 20.00 | .580 |
| 22.00 | .540 |
| 25.00 | .490 |
| 27.00 | . 460 |
| 30.00 | .420 |
| 32.00 | .400 |
| 35.00 | .340 |
| 40.00 | .310 |
| 45.00 | .270 |
| 50.00 | .240 |
| 55.00 | .210 |
| 60.00 | .180 |
| 70.00 | .140 |
| 80.00 | .120 |
| 88.00 | .100 |
| 98.00 | .080 |
| 118.00 | .050 |
| 138.00 | .040 |
| 158.00 | .030 |
| 188.00 | .020 |
| 218.00 | .020 |
| 263.00 | .010 .010 |
| 383.00 | ,010 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED VALUES FOR HO (FEET)

.7271

.8443

.8871

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 5.03E-05 FT/sec = 1.53E-03 CM/sec TRANSHISSIVITY = 1.03E-03 FT++2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 1.59E-05 FT/sec = 4.84E-04 CM/sec

TRANSMISSIVITY = 3.26E-04 FT##2/sec

12/11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water from TOC

Elevation TOC (ft)

Water Level Elev. (ft)

** Well Number: 2587BR

12/01/87

23.95

5960.96

5937.01

12/11/87

Water Level Data for Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 2587BR

12/01/87

23.95

5960.96

5937.01

INDEX OF DATA

| Boring | No.: 26-87 |
|-------------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| X | Log of Borehole |
| X | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| | Packer Test Data and Results |
| x | Water Level Data |

| Coordinate Total Dept Drilling Col Date Drille Drilling Med | mpany Boyles Bros d September 23, 1987 thod Hollow Stem Auger Geologist Water Level P. M Helper S. B Drilling Fluid Checked By | Static esa radfield None |
|--|--|---|
| 0 | | Samples Collected or Other Tests Performed |
| <u></u> | TOPSOIL O.0-2.0' SAMPLE. Recovered 1.3/2.0' = 65%. O.0-0.3': TOPSOIL: dusky brown (5 YR 2/2); silty; fine-grained sands; gravels; poorly sorted; dry. ROCKY FLATS ALLUVIUM O.3-2.0': SAND AND GRAVEL: very pale orange (10 YR 8/2); silty; fine-grained sands; subangular to subrounded gravel; poorly sorted; weakly cemented; very calcareous; moist. | HNu Background=0.8 OVA Background=0.0 4.0-6.0': Reading on core: OVA = 1.6. 6.0-8.0': Reading on core: HNu = 1.4; OVA = 12.4. 14.0-16.0': Reading on core: OVA = 12.2. |
| 10 | 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. SAND AND GRAVEL: same as above; moist. 4.0-6.0' SAMPLE. Recovered 1.1/2.0' = 55%. SAND AND GRAVEL: pale yellowish orange (10 YR 8/6) to moderate yellowish brown (10 YR 5/4); clayey; fine-grained | |
| <u>15</u> | sands; subangular to subrounded; poorly sorted; slightly calcareous; moderately cemented; moist. | |

| Location Rocky Flats Plant; Excoordinates N 36261.48 E Total Depth 18.00' Drilling Company Boyles Bros Date Drilled September 23, Drilling Method Hollow Stem Au Logged By R. T. Treat Geologist | 24381.98 Ground Surface Water Level Driller P. Me 1987 Helper S. Br | Encountered Static esa radfield None |
|--|--|---|
| Comments | Lithologic Description | Samples Collected or Other Tests Performed |
| 6.0-8.0' Recover SAND A YR 7/4 poorly sands; was and secover SAND A YR 7/4 6/6); cliar to mented; 10.0-12.4 Recover CLAY A sandy; ous; poor 12.0-14.4 Recover 12.0-13.3 above; recover 13.2-14.6 gray (No. 13.2-14.6 gray (No. 13.2-14.6 gray (No. 13.2-14.6 gray (No. 14.2-14.6 gray (No. 14 | SAMPLE. red 0.7/2.0' = 35%. AND GRAVEL: grayish orange (10); slightly silty; scattered gravels; sorted; fine to medium-grained weakly cemented; moist. P. SAMPLE. red 1.2/2.0' = 60%. AND GRAVEL: grayish orange (10 YR ayey; fine-grained sand; subangusubrounded gravels; weakly ceslightly calcareous; moist. P. SAMPLE. red 2.0/2.0' = 100%. AND GRAVEL: light gray (N 7/0); medium plastic; slightly calcareorly sorted; moist. P. SAMPLE. red 1.4/2.0' = 70%. P. SAMPLE. red 1.4/2.0' = 70%. P. SAMPLE. red 1.4/2.0' = 70%. P. SAMPLE: red 1.4/2.0' = 70%. P. SAMPLE: red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. Red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. Red 1.4/2.0' = 100%. Red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. Red 1.4/2.0' = 100%. Red 1.4/2.0' = 100%. P. SAMPLE: red 1.4/2.0' = 100%. Red 1.4/2.0 | |
| + + + | | |

| Coordinates | Flats Plant; East Trenches A N 36261.48 E 24381.98 18.00' W Boyles Bros September 23, 1987 Hollow Stem Auger T. Treat Geologist | Ground Surfac Water Level 1 | Elevation 5954.06' Encountered Static sa adfield None |
|-------------|---|---|---|
| | Lithologic D | escription | Samples Collected or Other Tests Performed |
| | 14.0-16.0' SAMPLE. Recovered 2.0/2.0' = 10 CLAYSTONE: medium to medium gray (N 5 slightly Fe stained; weathered; moist. 16.0-18.0' SAMPLE. Recovered 2.0/2.0' = 1 CLAYSTONE: same a TOTAL DEPTH: 18.0 | m light gray (N 6/0) (0); massive; blocky; slightly calcareous; 100%. s above; moist. | |
| - | | | |
| - + | | | |
| † | † † | | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; East Trenches Area Well No. 26-87 Coordinates N 36261.48 E 24381.98 Elevation: Ground Surface _5954.06' Total Depth: Well ___13.70' Borehole 18.00' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter stainless steel Date Installed Sept. 24, 1987 Approved By Installed By R. T. Treat Geologist Comments 3.00' Top of Casing 1.91' Ground Surface Surface Casing Depth (ft.) Surface Seal 2.00 Material: Portland Type I cement Surface Seal 2.00 Longth (ft.) Borehole Diameter: 7.5" Bentonite 2.00 8.01 Longth (ft.) Filter Material: Top of Screen Depth: 4.00' 32-42 Silica Sand Well Total 13.70 Depth (ft.) Filter Pack 10.00 | Length (ft.) Borchole Length 18.00 Total Depth 9.45 (ft.) 4 18 Backfill 4.00 Length (ft.)

3/8" Volclay Bentonite Pellets

12, 11/87

Water Level Data for

Rockwell (Rocky Flats)

Date Measured Depth to Water Elevation from TOC

TOC (ft)

Water Level Elev. (ft)

** Well Number: 2687

12/01/87

12.53

5955.97

5943.44

INDEX OF DATA

| Boring | No.: 27-87 | |
|---------|----------------------------------|--|
| Comple | ted as well? Yes | |
| Data in | File | |
| X | Log of Borehole | |
| X_ | Well Construction Summaries | |
| | Well Development Summaries | |
| | Hydraulic Conductivity Test Data | |
| | and Results | |
| | Packer Test Data and Results | |
| X | Water Level Data | |

Location Rocky Flats Plant; East Trenches AreaBorehole/Well No. 27-87 Coordinates N 36442.01 E 24944.62 Ground Surface Elevation 5947.52' Total Depth 47.4' Water Level Encountered 36.5' Static . Driller T. Merritt; D. Jarvie Drilling Company Boyles Bros Helper J. Duncan; T. Merritt; P. Mesa Date Drilled September 3-10, 1987 Drilling Method Hollow Stem Auger Drilling Fluid Logged By J.L. Bannon Checked By Geologist Comments 460 Samples Collected or Lithologic Description Other Tests Performed **TOPSOIL** HNu Background=0.2 OVA Background=0.8 0.0-1.5' SAMPLE. No Ludlum readings Recovered 1.3/1.5' = 87%. taken. 0.0-0.22': TOPSOIL: dusky brown (5 YR 2/2) clay with abundant roots and grasses. No readings over background on core. **ROCKY FLATS ALLUVIUM** No readings over 0.22-1.0': SAND AND GRAVEL: very background on core. dusky red (10 R 2/2); very fine silty sand with occasional pebbles; unconsolidated. 11.29': Readings on 1.0-1.3': SAND: grayish orange pink (10 R cuttings: HNu = 0.8; 8/2); fine-grained caliche sand; unconsol-OVA = 0.2. idated; strong HCl reaction. 17.2': OVA = 5.0 at 1.5-3.0' SAMPLE. cuttings, 0.8 at well Recovered 1.2/1.5' = 80%. head. 10 SAND AND GRAVEL: moderate orange pink (5 YR 8/4); very fine-grained, clayey, caliche sand with subangular to subrounded quartzite pebbles, particularly at lower end; powdery; strong HCl reaction; dry. 3.0-4.0' SAMPLE. Recovered 1.45/1.0' = 145%. SAND AND GRAVEL: very pale orange <u>15</u> (10 YR 8/2) to pale yellowish orange (10 YR 8/6) very fine-grained clayey sand with abundant subangular to subrounded caliche-coated quartzite pebbles; strong HCl reaction; dry. 20

| Coordinated Total Depth Drilling Com Date Drilling Met | Rocky Flats Plant; East Tre N 36442.01 E 24944.62 47.4' Rocky Flats Plant; East Tre N 36442.01 E 24944.62 47.4' Rocky Flats Plant; East Tre Bould Stem Auger J.L. Bannon Geologiet | Ground Surfac Water Level Driller T. Me | Elevation 5947.52' Encountered 36.5' Static rritt; D. Jarvie ncan; T. Merritt; P. Mesa None |
|--|--|---|--|
| 20 | Lithold | ogic Description | Samples Collected or Other Tests Performed |
| <u>25</u> | brown (10 YR 4/4); poor coarse-grained coarse-grain | 0.5' = 130%. GRAVEL: dark yellowish 4/2) to moderate brown (5 ely sorted very fine to clayey caliche sand with subrounded caliche-coated es; unconsolidated to moddated down-core; strong a pebble surface, weak on dry to damp. | |
| <u>30</u> | 6/6); medium unconsolidated; damp. 5.0-5.5' SAMPLE Recovered 0.71/SAND AND Corange (10 Y) | | |
| 35 | subrounded qui | artzite pebbles near botated; strong HCl reaction; | |
| 40 | | | |

| Location | Rocky Flats Plant; East Tre | enches Areamorehole/wel | II No. 27-87 |
|------------|---|--|---|
| | N 36442.01 E 24944.62 | | ce Elevation 5947.52' |
| | pth 47.4' | | Encountered 36.5' |
| | | | Static |
| Drilling (| Company Boyles Bros | Oriller T. M | erritt; D. Jarvie |
| Date Dril | September 3-10, 1987 | | uncan; T. Merritt; P. Mesa |
| Drilling N | sethod Hollow Stem Auger | Drilling Fluid | None |
| Logged | J.L. Bannon | Checked By | |
| | Geologist | 0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | Site Manager |
| | | • | CEARP Manager |
| Comment | | | |
| | | | |
| 40 | Litholo | gic Description | Samples Collected or Other Tests Performed |
| <u>45</u> | yellowish orange grained, clayey quartzite pebbles 5.72-6.0': grayish fine-grained cla unconsolidated; sdry. 6.0-6.5' SAMPLE with center bit. 6.5-7.5' SAMPLE. Recovered 0.61/1 | AND GRAVEL: dark (10 YR 6/6); mediumsand with abundant (10 yr 10 y | |
| _50 | orange (10 YR grained clayey quartzite pebbles | RAVEL: dark yellowish 6/6); medium to coarse-sand with abundant; unconsolidated; moist. | |
| | ish brown (10 clayey sand with quartzite pebbles ward into mode 7/4) fine to | O' = 75%. AVEL: moderate yellow- YR 5/4); coarse-grained abundant caliche-coated s; moist. Grades down- rate orange pink (10 R medium-grained, poorly id; minor clay; unconsol- | |
| | | | |
| | | | Page 3 et 10 |

| Coordinates N 36442.01 E 24944.62 Total Depth 47.4' | Ground Surface Elevation 5947.52' Water Level Encountered 36.5' |
|--|---|
| Drilling Company Boyles Bros Date Drilled September 3-10, 1987 Drilling Method Hollow Stem Auger Logged By J.L. Bannon Geologist | Driller T. Merritt; D. Jarvie Helper J. Duncan; T. Merritt; P. Mes Drilling Fluid None Checked By Site Manager CEARP Manager |
| CommentsLithologic E | Samples Collected or Other Tests Performs |
| TOTAL DEPTH WITH READJUST DEPTH. 8.3-9.4' SAMPLE. No with center bit. 9.4-10.0' SAMPLE. Recovered 0.52/0.6' = SAND AND GRAVEI brown (10 YR 4/2) gr light olive gray (5 Y grained, poorly sorted bles less abundant; sti subrounded quartz an caliche; moderately coate HCl reaction; dam TOTAL DEPTH WITH READJUST DEPTH. 10.1-11.29' SAMPLE. Drilled with center bit li.29-11.9' SAMPLE. Prilled with center bit li.29-11.9' SAMPLE are covered 0.61/0.61' = SAND AND GRAVEI brown (10 R 4/6); find poorly sorted clayey signartzite pebbles; model dated; minor caliche; damp. | 87%. L: dark yellowish rading down into 6/1); fine to coarsell clayey sand; pebill subangular to d quartzite; less consolidated; moderate. H PLOPPER: 10.1'; No recovery. it. 100%. L: moderate reddish to to coarse-grained, and with large derately consoli- |
| _ | Page 4 10 |

| Coordinates N 36442. Total Depth 47.4' Drilling Company Boy Date Drilled September Drilling Method Hollow Logged By J.L. Bann | 7les Bros er 3-10, 1987 v Stem Auger | Ground Water (Driller Helper Drilling | Surface Eleva evel Encount Static T. Merritt; I J. Duncan; T. Fluid None | 11on 5947.52' 36.5' |
|--|--|---|--|-----------------------------|
| Comments | ologist | Checke | d By | Site Manager CEARP Manager |
| | 11.9-12.15' SAM Recovered 0.6/0 SAND AND GI ish brown (10 clayey sand; we: 12.15-13.15' SAN Recovered 0.84/ SAND AND G (5 YR 4/4) g brown (5 YR grained, clayer strong HCI remoist. 13.15-14.65' SAN Recovered 1.2/1 SAND AND GR 5/6), fine to me with abundant quartzite pebbidated; very weal TOTAL DEPTH Readjust depth. 13.4-14.9' SAMPI Recovered 1.7/1. SAND AND GR 5/6), fine to coa clayey sand with | AVEL: moderate y YR 5/4); fine-grak HCl reaction. APLE. 1.0' = 84%. RAVEL: moderate rading down into 5/6); medium to 6 y sand; unconsoliaction, weak down APLE. 5' = 80%. AVEL: light brown dium-grained, clayer subangular to sub les; moderately cok HCl reaction; mois WITH PLOPPER: | brown light coarse-dated; n-core; (5 YR / sand round onsolit. 13.4'; (5 YR orted, cuban- | r Tests Performed |
| † † † | | | | |

| | 6442.01 E 24944.62 | Ground Surface Elevation 5947.52 | |
|------------------|---|---|------|
| Total Depth 47. | | Water Level Encountered 36.51 | |
| | | Static | |
| Drilling Company | Boyles Bros | Orllor T. Merritt; D. Jarvie | |
| | cember 3-10, 1987 | Heiper J. Duncan; T. Merritt; P. | Mes |
| <u> </u> | ollow Stem Auger | Drilling Fluid None | |
| | | | |
| Logged By J.L. | Geologist | Checked By Site Manage | r |
| | | CEARP Manag | 100 |
| Comments | | | |
| | Lithologic | Description Samples Collecter Other Tests Perfo | d or |
| | 14.9-15.15' SAMPLE | | |
| † † | Recovered 0.26/0.25 | ' = 104%. | i |
| 1 1 | SAND AND GRAV | EL: same as above. | j |
| | 15 15-15 0' SAMDI E | No recovery. Drilled | - 1 |
| + + | with center bit. | , No recovery. Drined | |
| | 1 | } | ł |
| TI | 15.9-17.2' SAMPLE. | | į |
| - + + | Recovered 1.1/1.3' = | | - [|
| 1 1 | brown (10 R 4/6), n | EL: moderate reddish | 1 |
| † † | grained, poorly sort | | |
| + + | | cobbles; minor clay; | 1 |
| | consolidated; moist. | | - } |
| + + | 172 180 54 180 | No. 20 D West | |
| 1 1 | with center bit. | No recovery. Drilled | |
| Ţ | with center bit. | | 1 |
| - + + | + <u>18.0-19.0' SAMPLE.</u> | | - |
| | Recovered 1.04/1.0' | . | - |
| † † | | own (5 YR 4/4), fine- | |
| + + | solidated; moist. | clayey sand; uncon- | - [|
| | soridated, moist. | ļ | |
| † † | TOTAL DEPTH WI | TH PLOPPER: 19.1'; | |
| 1 1 | Readjust depth. | | |
| | 10 1 21 11 2 12 22 2 | | |
| - + + | 19.1-21.1' SAMPLE. Recovered 2.02/2.0' | - 101% | 1 |
| 1 1 | | = 101%. own (5 YR 4/4), fine- | 1 |
| [[| grained, well sorted | | 1 |
| + + | solidated; no pebble | | 1 |
| (| moist. | | |
| † † | † | 1 | |
| 1 1 | . 1 | 1 | - |
| II | | j · | |

Page 6 of 10

| | <u>ky Flats Plant; East Tr</u> enche N <u>36442.01 E 24944.62</u> | | ce Elevation 5947.52' |
|----------------|--|-----------------------|---|
| Total Depth | | | Encountered 36.5' |
| | | W 5 (5) | Static |
| Drilling Compa | ny Boyles Bros | Driller T. M | lerritt; D. Jarvie |
| | September 3-10, 1987 | - | uncan; T. Merritt; P. Mes |
| · | Hollow Stem Auger | Drilling Fluid | |
| Logged By | | Checked By | $A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow A \rightarrow$ |
| | Geologist | Checkes by | Site Manager |
| | | | CEARP Manager |
| Comments — | | | |
| | Lithologic E |) escription | Samples Collected or Other Tests Performe |
| 1 | 21.1-23.1' SAMPLE. Recovered 1.78/2.0' = | 89% | |
| | SAND: moderate rec | ddish brown (10 R | |
| Ť | 4/6), fine-grained, ver | | |
| 1 | sand; consolidated; moist. | no HCl reaction; | |
| | moist. | | |
| † | † 23.1-25.1' SAMPLE. | | |
| - + | Recovered $2.0/2.0' = 1$ | | |
| | SAND: moderate red | • | 1 |
| † | 4/6), fine-grained, versand; consolidated v | | |
| + | sand; subangular to s | | 1 |
| | moist. | , | |
| + | + + 25 1-27 1' SANADI E. | | |
| 1 | $\frac{25.1-27.1' \text{ SAMPLE:}}{\text{Recovered } 1.9/2.0' = 9}$ | 95%. | |
| | SAND AND GRAVE | | |
| — † | † ish brown (10 YR 5/ | 4) fine-grained, well | |
| 1 | sorted sand with pe | bble layers; consoli- | |
| Ţ | dated; moist. | | 1 |
| † | † † 27.1-28.6' SAMPLE. | | 1 |
| 1 | $\int Recovered 1.65/1.5' =$ | | 1 |
| T | SAND AND GRAVE | | |
| + | 5/6) very fine-grained | • | 3 |
| _ 1 | sand with quartzite p | could layers, consol- | 1 |
| — T | T T | | 1 |
| + | + 28.6-31.9' SAMPLE. N | o recovery. Drilled | |
| 1 | with center bit. | | |
| T | TT | | |
| 1 | + + | | |
| | | | |
| + | † † | | |
| J | i i | | l l |

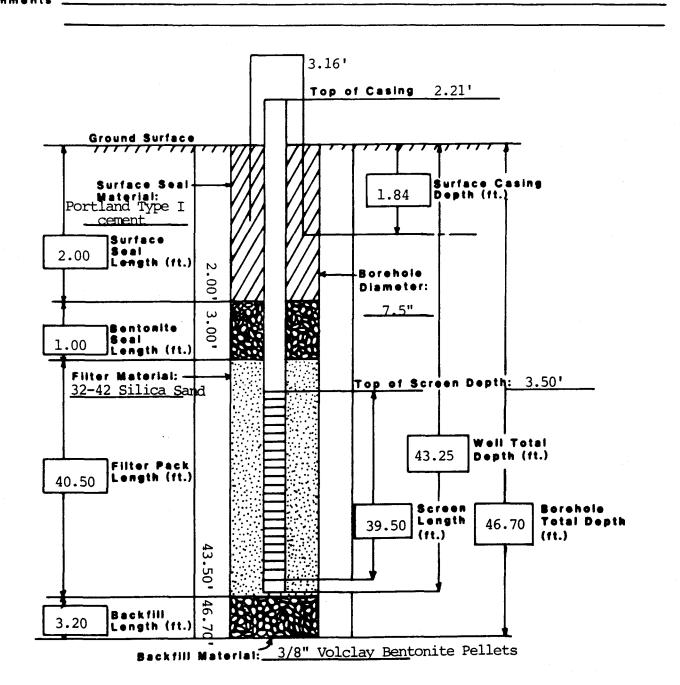
| Coordinates N 36442.01 E 24944.62 Total Depth 47.4' Drilling Company Boyles Bros Date Drilled September 3-10, 1987 | Ground Surface Elevation 5947.52' Water Level Encountered 36.5' Static Driller T. Merritt; D. Jarvie |
|---|---|
| Drilling Company Boyles Bros Date Drilled September 3-10, 1987 | Static |
| Date Drilled September 3-10, 1987 | |
| Date Drilled September 3-10, 1987 | Driller 1. Metitit; D. Jaivie |
| | Helper J. Duncan; T. Merritt; P. Me |
| | |
| Drilling Method Hollow Stem Auger | Drilling Fluid None |
| Logged By J.L. Bannon Geologist | Checked By Site Manager |
| | CEARP Manager |
| Comments | |
| Lithologic D | Samples Collected of Other Tests Perform |
| | |
| 31.9-33.9' SAMPLE. | 0.40 |
| Recovered 1.68/2.0' = SAND: light brown | |
| medium-grained clay | ey sand: clay in- |
| creases down core; no | HCl reaction; moist. |
| 22.0.25.02.5.43.401.5 | |
| 33.9-35.9' SAMPLE. Recovered 1.96/2.0' = | 28% |
| SAND AND GRAVEL | |
| 5/6) fine to medium | grained sand with |
| abundant quartzite p | pebbles down core; |
| 1 1 moist. | |
| 35.9-37.9' SAMPLE. | |
| Recovered $1.99/2.0' = 1.99/2.0'$ | |
| SAND: light brown (5 | YR 5/6) medium to |
| coarse-grained, clayey sional large quartzite | sand with occa- |
| TABLE at 36.5': low | er 0.42' core is vel- |
| lowish gray (5 Y 7) | 2) very fine silty |
| † † sand; moist. | |
| † † TOTAL DEPTH WITH | I PI OPPER: 36 9' |
| READJUST DEPTH. | 1 2011 EK. 30.5, |
| T I I aca an aca aca | |
| $\frac{36.9-38.9' \text{ SAMPLE.}}{\text{Recovered } 1.7/2.0' = 85}$ | r _W |
| 36.90-37.72': SAND: r | |
| YR 4/4); medium to o | oarse-grained sand: |
| + + + moist. | |
| 37.72-38.00': SAND AN | D SILT: yellowish |
| gray (5 Y 7/2) very f | ine-grained, clayey |
| + + + ********************************* | |
| | |
| † † † | |
| | 8 10 |

| | <u>ats Plant: East Tr</u> enche 42.01 | | No. 27-87 Elevation 5947.52' |
|---------------------|---|--|-------------------------------|
| | | | Encountered 36.5' |
| Total Depth 47.4 | | Water Level | Static |
| Drilling Company _ | Boyles Bros | Driller T. Me | erritt; D. Jarvie |
| Date Drilled Septe | | | uncan; T. Merritt; P. Mesa |
| Drilling Method Hol | | Drilling Fluid | |
| Logged By J.L. B | | Checked By | |
| | Geologist | | Site Manager |
| 0 | | • | CEARP Manager |
| Comments | / <u>*</u> / | | / |
| | Lithologic E | Description | Other Tests Performed |
| | 38.00-38.55': SAND: gray (5 Y 7/2), very sand and oxidized lightine to medium-grained 38.55-38.9': SAND: pot to coarse-grained, peb to coarse-grained, peb 38.9-40.9' SAMPLE. Recovered 1.41/2.0' = SAND AND GRAVE (5 YR 4/4), poorly sor grained sand with layer of pale yellow 6/2) clayey sand; u wet. 40.9-42.9' SAMPLE. Recovered 1.65/2.0' = 40.9-42.75': SAND AN sorted; medium to with abundant subang quartzite pebbles; urwet. | fine-grained clayey ht brown (5 YR 5/6) ed sand. corly sorted medium bly sand. 70%. L: moderate brown ted fine to medium-pebbles; thin (.16') rish brown (10 YR nconsolidated; very 82%. D GRAVEL: poorly coarse-grained sand gular to subrounded | |
| | ARAPAHOE F 42.75-42.9': CLAYSTO (5 Y 5/2) mottled moist. | NE: light olive gray | |
| | | | |

| Location Rocky Flats | Plant: East Trenches | Areasorehole/Well | No. <u>27-87</u> |
|------------------------|--|--|---|
| Coordinates N 36442. | | | • Elevation 5947.52' |
| Total Depth 47.4' | | | Encountered 36.5 |
| | | | Static |
| Drilling Company Boy | les Bros | Driller T. Me | rritt; D. Jarvie |
| Date Drilled September | er 3-10, 1987 | Helper J. Du | incan; T. Merritt; P. Mesa |
| Drilling Method Hollow | Stem Auger | Drilling Fluid | None |
| Logged By J.L. Bann | ion | Checked By _ | AlParche |
| | ologist | _ | Site Manager |
| | | - | CEARP Manager |
| Comments - | | | |
| - | | | |
| | Lithologic D | escription | Samples Collected or Other Tests Performed |
| | 42.9-44.9' SAMPLE. Recovered 2.27/2.0' = CLAYSTONE: light o mottled clay benea unconsolidated slough; 44.9-45.9' SAMPLE. Recovered 1.6/1.0' = 10 CLAYSTONE: light o mottled clay; unconso solidated down core. 45.9-47.4' SAMPLE. Recovered 1.88/1.5' = CLAYSTONE: light o with mottled dusky ye TOTAL DEPTH: 47.40 | live gray (5 Y 5/2) th coarse-grained, very wet. 60%. live gray (5 Y 5/2) lidated top .6'; con- 125%. live gray (5 Y 5/2) llow (5 Y 6/4) clay. | |
| + + - | | | |
| - - | | | Page 10 of 10 |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; East Trenches Area Well No. 27-87 Elevation: Ground Surface 5947.52' Coordinates N 36442.01 E 24944.62 Total Depth: Well 43.25' Borehole 46.70' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter 2" ID Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter stainless steel Date installed Sept. 10, 1987 Approved By installed By J. L. Bannon Geologist Comments



12, 11/87

Water Level Data for

Rockwell (Rocky Flats)

| Date Measured | Depth to Water from TOC | Elevation TOC (ft) | Water Level Elev. (ft) |
|------------------|-------------------------|-----------------------|---------------------------|
| | | | |
| ** Well Number | ·: 2787 | | |
| 11/09/87 | 87.10 | 5949.73 | 5862.63 |
| 12/01/87 | 42.65 | 5949.73 | 5907.08 |

INDEX OF DATA

| Boring | No.: 28-87BR |
|-----------|----------------------------------|
| Comple | ted as well? Yes |
| Data in | File |
| <u> </u> | Log of Borehole |
| X_ | Well Construction Summaries |
| | Well Development Summaries |
| | Hydraulic Conductivity Test Data |
| | and Results |
| <u> X</u> | Packer Test Data and Results |
| | Water Level Data |

Location Rocky Flats Plant; East Trenches Area Borehole/Well No. 28-87BR Coordinates N 36442.31 E 24983.42 Ground Surface Elevation 5947.17' Total Depth __207.00 ' Static _ Drilling Company Boyles Bros Driller R. Sharp; P. Bushkovski Date Drilled Sept. 3-9: Sept. 11-15, 1987 Helper S. Bradfield: K. Parker 0.0-55.5': None Drilling Method Hollow Stem Auger: Rotary Core Drilling Fluid 55.5'-207.0': Water Logged By J.B. Bergman; R.T. Treat Checked By Geologist CEARP Surface casing set to 55.5' by J.B. Bergman on September 8, 1987. Comments -, °° Samples Collected or Other Tests Performed Lithologic Description **ROCKY FLATS ALLUVIUM** HNu Background=0.4 OVA Background=0.0 0.0-2.0' SAMPLE. No Ludlum readings Recovered 1.3/2.0' = 65%. taken. 0.0-0.5': CLAY AND GRAVEL: grayish No readings over brown (5 YR 3/2); abundant quartzite background on core. pebbles; roots and grasses on top; poorly sorted; unconsolidated; angular; dry. 6.0': Readings at well 0.5-1.3': SAND AND GRAVEL: moderate head: HNu = 1: OVA 5 yellowish brown (10 YR 5/4); medium to = 22. coarse-grained; unsorted; unconsoldiated; abundant quartzite pebbles and gravels; some caliche; dry. 2.0-4.0' SAMPLE. Recovered 1.4/2.0' = 70%. SAND AND GRAVEL: moderate yellowish brown (10 YR 5/4); medium to coarse-10 grained; abundant quartzite gravels and pebbles; some clay; some caliche; unconsolidated; unsorted; dry. 4.0-6.0' SAMPLE. Recovered 1.0/2.0' = 50%. \$ANDY CLAY AND GRAVEL: moderate brown (5 YR 4/4); medium to coarsegrained; unsorted; angular; abundant; <u>15</u> light brown (5 YR 4/2) iron nodules and stains; abundant caliche; dry. 6.0-8.0' SAMPLE. Recovered $1.1/2.0^{\circ} = 55\%$. SANDY CLAY AND GRAVEL: same as above; dry to slightly damp.

20

| Location | Rocky Flats Plant; East Trenches Area Boroh | ole/Well No. 28-87BR |
|------------|--|---|
| | | d Surface Elevation 5947.17' |
| Total De | | Level Encountered17.7' |
| | | Static |
| Drilling C | ompany Boyles Bros Drille | R. Sharp; P. Bushkovski |
| | | S. Bradfield: K. Parker |
| | lethed Hollow Stem Auger: Rotary Core Drilling | 0 0-55 51 None |
| | | 55.5'-207.0': Water // \/ |
| | Geologist Check | Site Manager |
| | Company and the SS SI by I.D. David | CEARP Manager |
| Comment | Surface casing set to 55.5' by J.B. Berg | gman on September 8, 1987. |
| | Lithologic Description | Samples Collected or Other Tests Performed |
| 20 | 7,8 7,4 7, | |
| | SO 100' SAMPLE | |
| | $\frac{8.0-10.0' \text{ SAMPLE.}}{\text{Recovered } 1.8/2.0' = 90\%.}$ | |
| | SANDY CLAY AND GRAVEL: mo | oderate |
| | brown (5 YR 4/4); abundant quart | |
| | pebbles and gravels; angular to sub | |
| | rounded; fine to medium-grained s | |
| | FeO stains-dark yellowish orange (| |
| 25 | 6/6); unsorted; some caliche; slight solidated; dry. | ly con- |
| _ | solidated, dry. | |
| | 10.0-12.0' SAMPLE. | |
| | Recovered $1.3/2.0' = 65\%$. | İ |
| | SANDY CLAY AND GRAVEL: sa | |
| | above; caliche stops at 10.5'; slightl | ly |
| | damp. | |
| | 12.0-14.0' SAMPLE. | |
| _30 | Recovered $1.3/2.0' = 65\%$. | 1 |
| | SAND AND GRAVEL: moderate b | |
| | (5 YR 4/4); abundant coarse-grains | |
| | and gravel; poorly sorted; unconsol | |
| | some clay; subangular to rounded; caliche; moist. | some |
| | cancie, moist. | |
| | TOTAL DEPTH WITH PLOPPER: | 13.7': |
| | READJUST DEPTH. | · |
| | | |
| _35 | 13.7-15.7' SAMPLE. | |
| | Recovered $1.5/2.0' = 75\%$. | |
| | SANDY CLAY AND GRAVEL: m | |
| | brown (5 YR 4/4); abundant q | |
| | pebbles and gravels; angular; sorted; very fine-grained sand; l | |
| | neous; trace caliche; unconso | |
| | moist. | , |
| | T 7 | |
| _40 | 1909/981/ | |

| Location | Rocky Flats Plant; East Trenches Ar | ea Barabala /W - II | Ma 28-87BR |
|---|--|---------------------|--|
| | N 36442.31 E 24983.42 | | • Elevation <u>5947.17'</u> |
| | 207.00' | | Encountered 17.7' |
| , | | | Static |
| Drilling C | ompany Boyles Bros | | arp; P. Bushkovski |
| | •d Sept. 3-9: Sept. 11-15, 1987 | | adfield: K. Parker |
| Drilling M | ethod Hollow Stem Auger: Rotary Cor | a Orillian Fluid | 0.0-55.5': None |
| Logged B | J.B. Bergman: R.T. Treat | | 55.5'-207.0': Water |
| | Geologist | Checked By _ | Site Manager |
| | | _ | CEASO Magazina |
| Commont | Surface casing set to 55.5' by J | .B. Bergman on | CEARP Manager September 8, 1987. |
| Communi | | | |
| | | | |
| / | | | Annalas Callastad as |
| /. | Lithologic Desc | ription | Samples Collected or Other Tests Performed |
| 40 | 4/6~/4/ | | |
| | | | |
| | 15.7-17.7' SAMPLE. | | 1 |
| | Recovered 1.1/2.0' = 55%. SAND AND GRAVEL: sa | me as above but | |
| | less clay and more med | | |
| | grained sand; moist. | 214111 10 004150 | 1 |
| | | | |
| | 17.7-19.7' SAMPLE. | | |
| | Recovered $1.3/2.0' = 65\%$. | | |
| 45 | CLAY AND GRAVEL: | | 7 |
| | (5 YR 4/4); abundant q trace caliche; consolida | | 1 |
| | poor sorting; moist to wet | | |
| | poor sormag, months we | • | |
| | 19.7-21.3' SAMPLE. | |] |
| | Recovered $1.6/1.6' = 100\%$ | | 1 |
| | 19.7-20.1': CLAY AND G | RAVEL: same as | |
| | above; wet. 20.1-21.3': SANDY CLAY | AND CRAVEL | 1 |
| 50 | same as above but mor | | |
| | fewer gravels; very fir | | |
| | damp. | , | 1 |
| | | | |
| | 21.3-23.3' SAMPLE. | | |
| | Recovered 2.0/2.0' = 100% CLAY: moderate brown | | |
| | abundant gravels and pet | | 1 |
| | trace coarse-grained sand; | | · · |
| <u>55</u> | rounded; some granite; tra | - | |
| | to moderate sorting; wet. | | } |
| | TEST I TANAGEMENT | | 1 |
| | $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | 1 |
| | CLAY AND GRAVEL: | | |
| | (5 YR 4/4); abundant q | | 1 |
| | and gravels; some FeO | | |
| | red (5 R 4/6); angular; po | orly sorted; very | 1 |
| 60 | moist. | | |

| Location | Rocky Fla | ats Plant; East Trenches A | rea Boroholo/Wal | I No. <u>28-</u> 87BR | | |
|---|------------|---|-------------------------|--|--|--|
| | | 2.31 E 24983.42 | | e Elevation 5947.17' | | |
| Total Depth 207.00' | | | Water Level Encountered | | | |
| | | | | Static | | |
| Drilling (| Company Bo | ovles Bros | Driller R. Sh | narp; P. Bushkovski | | |
| Date Drilled Sept. 3-9: Sept. 11-15, 1987 | | | | Helper S. Bradfield: K. Parker | | |
| | | low Stem Auger: Rotary Co | | 0.0-55.5': None | | |
| | | ergman: R.T. Treat | Checked By_ | 55.5'-207.0': Water | | |
| | <u> </u> | Geologist | CHOCKER BY . | Site Manager | | |
| | | | • | CEARP Manager | | |
| Commen | teSurfac | e casing set to 55.5' by | J.B. Bergman on | September 8, 1987. | | |
| | | | | | | |
| | 5/5 | / <u>•</u> / | | | | |
| | | Lithologic Det | eription | Samples Collected or Other Tests Performed | | |
| 60/5 | | | | / 51.1161 15615 167167 167167 | | |
| 002 | 13333 | : I | | | | |
| | | 25.3-27.3' SAMPLE. | | | | |
| | 至至 | Recovered $2.0/2.0' = 100'$ | | 1 | | |
| | | GRAVEL: moderate bro | | 1 . | | |
| | | quartzite gravels; some | | | | |
| | | grained sand; FeO noc | | | | |
| | | subrounded; unconsolida | ied, wei. | | | |
| | | T 27.3-29.3' SAMPLE. | | 1 | | |
| <u>65</u> | | Recovered $2.0/2.0' = 100'$ | %. | | | |
| | | GRAVEL: same as above | · | | | |
| | | + (0.10') sand nodules-gra | | | | |
| | | YR 7/4); coarse-grained | | i | | |
| | | angular; non-calcareous; dusky red (5 R 3/4) in s | | ŀ | | |
| | | dusky red (3 K 3/4) in si | noe, wet. | 1. | | |
| | | | | 1 | | |
| | | + 29.3-30.1' SAMPLE. | | | | |
| <u>70</u> | | Recovered $0.8/0.8' = 100$ | | | | |
| | | SAND AND GRAVEL: | | 1 | | |
| | | (5 YR 4/4); quartzite gr trace clay; angular; poor | | 1 | | |
| | | cobble of quartzite in sh | • | 1 | | |
| | | dated; damp. | , | 1 | | |
| | | 11 | | | | |
| | | T 30.6-32.6' SAMPLE. | | | | |
| | | \perp Recovered 1.2/2.0' = 609 | | | | |
| 75 | | SANDY CLAY AND GI | | | | |
| <u>75</u> | | brown (5 YR 4/4); abun | | | | |
| | | gravels and pebbles at to tent with depth; medium | | 1 | | |
| | | sand; consolidated; angu | - | | | |
| | | moist. | , | 1 | | |
| | | | | 1 | | |
| | 大三十 | 🕇 | | | | |
| | | 11 | | | | |
| | | T | | 1 | | |
| 0.0 | | | | | | |

| | | ats Plant; East Trenches And 42.31 E 24983.42 | _ | II No. 28-87BR | |
|---------------------|-------------|--|-------------------------------|--|--|
| Total Depth 207.00' | | | Water Level Encountered 17.7' | | |
| | | | | Static | |
| Drilling C | COMPANY R | oyles Bros | Dellas R. S | harp; P. Bushkovski | |
| | | - | | | |
| | - | 3-9: Sept. 11-15, 1987 | | radfield: K. Parker 0.0-55.5': None | |
| | | llow Stem Auger: Rotary Cor | ce Drilling Fluid | 55.5'-207.0': Water - | |
| rosseq : | J.B. Be | ergman: R.T. Treat | Checked By | QQ | |
| | | Geologist | | Site Manager | |
| | | | | CEARP Manager | |
| Comment | Surfac | ce casing set to 55.5' by | J.B. Bergman on | | |
| | | | | | |
| | | | | | |
| | 4 /5 | /• / | | | |
| /. | | Lithologic Des | crintian | Samples Collected or | |
| / 9 | | A / | | Other rests Performed | |
| 80 <u>Z</u> | | | | | |
| | | 32.6-34.6' SAMPLE. | | | |
| | | $\frac{1}{1}$ Recovered 1.7/2.0' = 85%. | | | |
| | | SANDY CLAY AND GR | | | |
| | 重計 | brown (5 YR 4/4); abund | | | |
| | | gravels; coarse-grained qu | | | |
| | | Tabundant black fragment | | ŀ | |
| | | pebbles at base; unsorted; | | | |
| 85 | | rounded to subangular; m | oist. | | |
| | 国 | TOTAL DEPTH WITH P | OPPED: 353' | | |
| | | READJUST DEPTH. | COLLER. 33.3, | | |
| | 建建 | | | | |
| | | → 35.3-37.3' SAMPLE. | | | |
| | | Recovered $1.3/2.0' = 65\%$. | | | |
| | 1333 | + CLAYEY SAND AND GI | | | |
| | 屋盖 | ate brown (5 YR 4/4); ab | | | |
| • | | gravels; medium to coarse ose sand; some clay; angu | | | |
| <u>90</u> | + | rounded; poorly sorted; sl | | | |
| | | l l | | | |
| | | 37.3-39.3' SAMPLE. | | | |
| | | $+\frac{57.559.5}{\text{Recovered } 1.4/2.0'} = 70\%.$ | | | |
| | 三 | SAND AND GRAVEL: sa | | | |
| | | trace clay; abundant gr | | | |
| | 三三 | 37.6'; saturated; poorly | | | |
| | [] | † mica; wet. | • | \ | |
| .95 | | 1 | | | |
| | | | | 1 | |
| | | † | | | |
| | | 11 | | 1 | |
| | 建 | IT | | 1 | |
| | | 11 | | | |
| | | 1 | | | |
| | | 1+ | | | |
| 100 | | | | 1 | |

| Location Rocky Flats Plant; East Trenches Are | ea Borehole/Well No. 28-87BR |
|---|--|
| Coordinates N 36442.31 E 24983.42 | Ground Surface Elevation 5947.17' |
| Total Depth 207.00' | Water Level Encountered |
| | Static |
| Drilling Company Boyles Bros | Driller R. Sharp; P. Bushkovski |
| Date Drilled Sept. 3-9: Sept. 11-15, 1987 | Helper S. Bradfield: K. Parker |
| Drilling Method Hollow Stem Auger: Rotary Core | 0.0-55.5': None |
| | 33.3 -20/.0 : Water // t- |
| Logged By J.B. Bergman; R.T. Treat Geologist | Checked By Site Manager |
| | one meneger |
| | CEARP Manager |
| Comments Surface casing set to 55.5' by J. | B. Bergman on September 8, 1987. |
| | |
| | |
| Lithologic Description | Samples Collected or |
| Lithologic Desci | |
| 100 | |
| | |
| 39.3-41.3' SAMPLE. | 1 |
| Recovered $1.8/2.0' = 90\%$. | |
| 39.3-40.0': SAND AND GR | AVEL: same as |
| above; slightly damp. | line and (5 V |
| 40.0-40.7': SAND: light of 6/1); coarse to fine-grained | |
| sorted; homogeneous; cons | |
| ceous: abundant clay: sligh | |
| 105 + 40.7-41.1': SAND: same | |
| abundant dark yellowish | |
| 6/6) nodules; layered <.05'; | slightly damp. |
| 4 | · |
| $\frac{41.3-43.3' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 100\%.}$ | |
| SAND AND GRAVEL: n | • |
| (5 YR 4/4); abundant qu | the contract of the contract o |
| † † coarse-grained quartzose s | |
| 110 dated; unsorted; angular; w | vet. |
| | 1 |
| $\frac{1}{1000} = \frac{43.3-43.5' \text{ SAMPLE.}}{\text{Recovered } 0.2/0.2' = 100\%.}$ | |
| SAND AND GRAVEL: lig. | |
| 5/1) to moderate brown (| |
| rounded to subangular in | ' '' |
| gravel; poorly sorted; nonc | emented; wet. |
| * * † | |
| 115 ARAPAHOE FORM | MATION |
| T T T | |
| + + 43.5-44.5' SAMPLE. No | recovery. As- |
| sumed weathered claystone | e, sandy. |
| * * * * * * * * * * | .] |
| 44.5-45.5' SAMPLE. No | |
| sumed weathered claystone | · |
| | |
| 120 | 1 |
| | 6 6 16 |
| | · • • • · · · · · · · · · · · · · · · · |

| Location R | ocky Flats Plant; East | Trenches Area Boreho | 10/Well No. 28 | -87BR |
|-------------|------------------------|---|-----------------|--|
| Coordinates | N 36442.31 E 24983 | | Surface Eleva | |
| Total Depth | 207.00' | Water | Level Encount | red |
| | | | Static _ | |
| | pany Boyles Bros | | R. Sharp; P. | |
| | Sept. 3-9: Sept. 11- | | S. Bradfield: | K. Parker 5': None |
| | od Hollow Stem Auger | | R PIWIG | 07.0': Water 1.4 |
| Logged By | J.B. Bergman; R.T. Tro | eat Check | ed By | Site Manager |
| | 400.04 | | | |
| | Surface engine est t | a CE E! har I D. Dawar | on Contombo | CEARP Manager |
| Comments - | Surface casing set to | o 55.5' by J.B. Bergi | nan on Septembe | 1 0, 198/. |
| - | | | | |
| | /8 /8 / | | /_ | |
| | LII | hologic Description | , | ples Collected or r Tests Performed |
| 120 | /6 ~ / 6 K / | | | |
| | | | | |
| + | 45.5-47.0' SA | | | |
| | | .5/1.5' = 100%. E: light gray (N 7) | (0) to | |
| † | | by $(N 5/0)$; moderate | | |
| E | 1 1 mented; ma | assive; blocky; slight | ly Fe | |
| . I | stained; wea | thered; moist. | | |
| + | 47.0-49.0' SA | MDLE | | |
| 125 | | .0/2.0' = 100%. | | |
| | | E: light gray (N 7/0); m | assive; | |
| + | slightly Fe | stained; blocky; medi | | |
| | highly plasti | c; weathered; moist. | | |
| Ī | 49.0-50.5' SA | MPLE. | | |
| - | | .5/1.5' = 100%. | | |
| - | | CLAYSTONE: light gr | | |
| 1 | | e; blocky; slightly Fe s | tained; | ļ |
| <u>13</u> 0 | | nedium plastic; moist. CLAYSTONE (SHALE) | · dark | |
| Ē | | 0); massive; only sligh | | |
| • | stained; med | lium plastic; blocky; m | | |
| 4 | slightly mois | st. | | |
| E | EN E 50 01 CA | MDLE | | |
| <u>†</u> | 50.5-52.0' SA | .5/1.5' = 100%. | | |
| E | | E (SHALE): medium | dark | |
| 125 | gray (N 4/0 |) to dark gray (N 3/0 |); mas- | |
| <u>13</u> 5 | | y; only slightly Fe s | stained; | |
| <u>F</u> | moist. | | | |
| Ē | | 1 (D) T | | |
| + | + 52.0-53.5' SA | | | |
| [5] | | .5/1.5' = 100%. E (SHALE): same as | above: | |
| 15 | moist. | _ (J.1.1.2.2). Jame 45 | | |
| <u>.</u> | | | 1 | 1 |
| 140 | | | .] | İ |

| Location | Rocky Flats Plant; Eas | t Trenches Area Borehole/ | Well No. 28-87BR |
|------------|---|---|---|
| Coordina | N 36442.31 E 2498 | 3,42 Ground Su | irface Elevation 5947.17' |
| Total De | pth <u>207.001</u> | Water Lev | vel Encountered 17.7' |
| | | | Static |
| Drilling (| company Boyles Bros | Driller R | . Sharp; P. Bushkovski |
| | • | | |
| Drilling 1 | Hed <u>Sept. 3-9: Sept. 11</u> Method <u>Hollow Stem Auge</u> | Data Compete S | 0.0-55.5': None |
| | | | 33.3'=20/.0': Water |
| rogged | J.B. Bergman: R.T. T | reat Checked (| By (|
| | 400.09.31 | | Site Manager |
| _ | Surface contra and | 55 51 Lu I D D | CEARP Menager |
| Commen | Surface casing set | LO 33.3 by 3.8. Bergman | on September 8, 1987. |
| | / _e / _o / _o / | | |
| | | thologic Description | Samples Collected of Other Tests Performs |
| 140 | 4/6 4/44 | - | / |
| | | | |
| | 53.5-55.0' S | AMPLE. | |
| | | 1.5/1.5' = 100%. | |
| | T | NE (SHALE): medium gray | · · |
| | | dium dark gray (N 4/0); n | |
| | | y; some slightly olive or | Fe |
| | staining; m | oist. | |
| | 56.0-60.0' S | A MDI F | 1 |
| 145 | | $\frac{21011 \text{LL}}{4.0/4.0} = 100\%.$ | |
| | | (4.0° = 100%. | |
| | | NE (SHALE): medium gray | (N |
| | 5/0); mass | ive; medium plastic; bloc | eky; |
| | trace fine-g | rained sand; moist. | |
| | 選封 , , , , , , , | | |
| | † 60.0-62.0' S | | |
| | $\begin{array}{c c} Recovered \\ RQD = 0.7/ \end{array}$ | 1.0/2.0' = 50%. | <u> </u> |
| 1.50 | | NE (SHALE): same as abo | ove. |
| 1-11 | moist. | (L (GII/IEE). Same as as | , , , |
| | | | 1 |
| | 62.0-65.5' S | AMPLE. | |
| | | $2.0/3.5^{\circ} = 57\%.$ | |
| | RQD = 0.9/ | | |
| | | NE (SHALE): medium d | ark |
| | | /0); massive; blocky; medi | |
| | plastic; mo | ist. | |
| 155 | | | |
| | 65.5-70.0' S | |] |
| | | 4.5/4.5' = 100%. | i i |
| | | 1/4.5' = 81%. NE (SHALE): dark gray | (N |
| | | ne (SHALE): dark gray edium gray (N 5/0); mass | |
| | | ium plastic; moist. | |
| | | iem piastie, moist. | 1 |
| | [] [] [] [] [] [] [] [] [] [] [] [] [] [| | 1 |
| 160 | [基] T | | |
| 160 | | | |
| | | | Page 8 of 16 |

| Coordina | | | Encountered 17.7' |
|-------------|-----------|---|---|
| TOTAL DE | ptn | Water Edver | Static |
| Drilling C | COMMANN D | ovles Bros Driller R. S | harp; P. Bushkovski |
| | | • | radfield: K. Parker |
| | | | O O EE E! None |
| | | llow Stem Auger: Rotary Core Drilling Fluid | 55.5'-207.0': Water \\ |
| rogges | J.B. B | ergman; R.T. Treat Checked By Geologist | Site Manager |
| • | Surfa | ce casing set to 55.5' by J.B. Bergman on | CEARP Manager September 8, 1987. |
| Comment | - Sulla | ce casing see to 33.3 by 6.b. bergman on | September 0, 1707. |
| 160 | | Lithologic Description | Samples Collected or Other Tests Performed |
| _ | | 70.0-74.0' SAMPLE. | |
| | | Recovered $4.0/4.0' = 100\%$. ROD = $2.65/4.0' = 66\%$. | |
| | | CLAYSTONE (SHALE): same as above | ; |
| | | ↓ moist. | |
| | | 740 700 SANGUE | |
| | | $\frac{74.0-78.0' \text{ SAMPLE.}}{\text{Recovered } 2.84/4.0'} = 71\%.$ | 1 |
| 165 | | ROD = $1.60/2.84$ ' = 56% . | - 1 |
| _ | | CLAYSTONE (SHALE): same as above | ; |
| | | + moist. | |
| | | | |
| | | 78.0-82.0' SAMPLE. | 1 |
| | | Recovered $4.0/4.0^{\circ} = 100\%$. | |
| | | RQD = 4.0/4.0' = 100%. CLAYSTONE (SHALE): medium light | . |
| | | gray (N 6/0); massive; blocky; medium | |
| <u>17</u> 0 | | plastic; moist. | |
| | | T | |
| | | 82.0-86.0' SAMPLE. | |
| | | Recovered 3.2/4.0' = 80%. | |
| | | RQD = 2.10/3.2' = 66%. CLAYSTONE (SHALE): same as above | . |
| | | moist. | '] |
| | [] | 17 | |
| | | 86.0-90.0' SAMPLE. | |
| 1 7 5 | | Recovered 3.6/4.0' = 90%. | |
| 175 | | RQD = 3.3/3.6' = 92%. | , [|
| | | CLAYSTONE (SHALE): dark gray (N + 3/0) to grayish black (N 2/0); massive | |
| | | blocky; moist. | ' |
| | | + ****** | 1 |
| | | 90.0-94.0' SAMPLE. | 1 |
| | | + Recovered 3.7/4.0' = 93%. | |
| | | RQD = 3.35/3.7' = 91%. | |
| | | CLAYSTONE (SHALE): same as above | 5 |
| 180 | P 1 | i moist | |

| Coordina | 100 <u>N 364</u> | ats Plant; East Trenches 42,31 | | ece Elevation <u>5947.17'</u> |
|-----------------------|--------------------------------------|--|---|--|
| Total De | pth <u>207.</u> | 00' | Water Level | Encountered 17.7' |
| Date Drill Drilling M | led <u>Sept.</u> lethod <u>Ho</u> | oyles Bros 3-9: Sept. 11-15, 1987 llow Stem Auger: Rotary ergman: R.T. Treat Geologist | Helper S. I | JJ.J TZU/.U i WALEL IA. |
| Comment | Surfa | ce casing set to 55.5' b | y J.B. Bergman or | |
| 180 | | Lithologic D | escription | Samples Collected or Other Tests Performe |
| <u>18</u> 5 | | 94.0-98.0' SAMPLE. Recovered 3.8/4.0' = 9. RQD = 3.8/3.8' = 100% CLAYSTONE (SHAL gray (N 6/0); some massive; moist. 98.0-102.0' SAMPLE. Recovered 3.5/4.0' = 8. RQD = 3.2/3.5' = 91%. CLAYEY SANDSTON 7/0) to medium dark grained sand; moderat lignite; moist. | b. E): medium light fine-grained sand 8%. NE: light gray (N gray (N 4/0); fine | , , , |
| <u>19</u> 0 | | 102.0-106.0' SAMPLE. Recovered 4.5/4.0' = 1 RQD = 4.5/4.5' = 100% 102.0-105.2': SANDSTO (N 5/0) to medium of fine-grained sand; slig ately cemented; moist. 105.2-106.0': SANDY of as above; moist. | o. ONE: medium gray dark gray (N 7/0) shtly clayey; moder | - |
| <u>195</u> | | 106.0-110.0' SAMPLE. Recovered 3.7/4.0' = 93 RQD = 3.2/3.7' = 87%. 106.0-106.3': SANDY (as above; moist. 106.3-110.0': SANDST((N 5/0) to medium (fine-grained sand; vecemented; moist. | CLAYSTONE: same ONE: medium gray dark gray (N 4/0) | ; |
| | | IT | | |

| .0010178 | N 36442.31 E 24983.42 | Ground Surface Elevation 5947.17' |
|--------------|---|--|
| | pth 207.00' | Water Level Encountered 17.7' |
| | | Static |
| rilling C | Company Boyles Bros | Driller R. Sharp; P. Bushkovski |
| | led <u>Sept. 3-9: Sept. 11-15.</u> 1987 | |
| | lethed Hollow Stem Auger: Rotary | 0 0 55 51 N |
| | J.B. Bergman; R.T. Treat | 55.5'-207.0': Water V |
| | Geologist | Checked By Site Manager |
| | | |
| omment | Surface casing set to 55.5' b | Oy J.B. Bergman on September 8, 1987. |
| | Lithologic E | Samples Collected of Other Tests Perform |
| 20 <u>0/</u> | Termed | |
| | 110.0-114.0' SAMPLE. | 1 |
| | Recovered $3.4/4.0^{\circ} = 8$ | 5%. |
| | RQD = 2.5/3.4' = 74%. | |
| | SANDSTONE: light | |
| | medium gray (N 5/0) | |
| | poorly sorted; mod | |
| | slightly clayey; massiv | e, moist. |
| <u> 205</u> | +114.0-118.0' SAMPLE. | |
| | Recovered $4.0/4.0^{\circ} = 10^{\circ}$ | 00%. |
| | + RQD = 3.8/4.0' = 95%. | |
| | SANDSTONE: mediur | |
| | medium dark gray (| |
| | grained sand; moderate | |
| | sive; clay lenses to c | aystone at bottom, |
| | | |
| | † † † | |
| 210 | 1 118.0-122.0' SAMPLE. | |
| 210 | $\frac{118.0-122.0' \text{ SAMPLE.}}{\text{Recovered } 3.7/4.0' = 93}$ | |
| 210 | $ \frac{118.0-122.0' \text{ SAMPLE.}}{\text{Recovered } 3.7/4.0' = 93} $ $ RQD = 3.1/3.7' = 84\%. $ | |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium | n gray (N 5/0); some |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa | n gray (N 5/0); some and; poorly sorted; |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium | n gray (N 5/0); some and; poorly sorted; |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 90 RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity | n gray (N 5/0); some and; poorly sorted; |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9.0 RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. | n gray (N 5/0); some and; poorly sorted; ; blocky; moist. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9: | n gray (N 5/0); some and; poorly sorted; blocky; moist. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9.0 RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9 RQD = 3.45/3.7' = 93% | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. 6. 6. 6. 6. 6. 6. 7. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 92 RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9 RQD = 3.45/3.7' = 93% CLAYSTONE: medium massive; blocky; moist | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. 6. 6. 6. 6. 6. 6. 7. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.45/3.7' = 93% CLAYSTONE: medium | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. 6. n dark gray (N 4/0); |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9 RQD = 3.45/3.7' = 93% CLAYSTONE: medium massive; blocky; moist 126.0-130.0' SAMPLE. Recovered 2.75/4.0' = RQD = 0%. | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. 6. n dark gray (N 4/0); 6. 69%. |
| 210 | 118.0-122.0' SAMPLE. Recovered 3.7/4.0' = 9: RQD = 3.1/3.7' = 84%. CLAYSTONE: medium very fine-grained sa massive; low plasticity 122.0-126.0' SAMPLE. Recovered 3.7/4.0' = 9 RQD = 3.45/3.7' = 93% CLAYSTONE: medium massive; blocky; moist 126.0-130.0' SAMPLE. Recovered 2.75/4.0' = | n gray (N 5/0); some and; poorly sorted; blocky; moist. 3%. 6. n dark gray (N 4/0); 6. 69%. |

| Location Rocky Flats | Plant; East Trenches Area Borehole/Well | No. <u>28-</u> 87BR |
|------------------------|---|---|
| Coordinates N 36442. | 31 E 24983.42 Ground Surface | e Elevation 5947.17' |
| Total Depth 207.00 | Water Level | Encountered 17.7' |
| | | |
| Drillian Company Band | D. Ch | Static |
| Drilling Company Boyle | | arp; P. Bushkovski |
| Sept. 3-9 | 9: Sept. 11-15. 1987 Helper S. Br Stem Auger: Rotary Core Drilling Fluid | adtield: K. Parker |
| Drilling Method Hallow | Stem Auger: Rotary Core Drilling Fluid | 55.5'-207.0': Water _\. |
| Logged By J.B. Bergn | nan: R.T. Treat Checked By | |
| G • • | ologist | Site Manager |
| Comments Surface of | easing set to 55.5' by J.B. Bergman on | CEARP Manager September 8, 1987. |
| | | |
| | Lithologic Description | Samples Collected or Other Tests Performe |
| | - <u>130,0-134.0' SAMPLE.</u> Recovered 4.8/4.0' =120%. | |
| | $RQD = 3.8/4.8^{\circ} = 79\%.$ | 1 |
| | CLAYSTONE (SHALE): medium dark | <u> </u> |
| + + + | gray $(N 4/0)$ to grayish black $(N 2/0)$; | į. |
| | massive; low to medium plastic; blocky; moist. | |
| TIT | 1110151. | 1 |
| -+++ | 134.0-138.0' SAMPLE. | 1 |
| | Recovered $2.65/4.0' = 66\%$. | j |
| † † † | RQD = 2.3/2.65' = 87%. | } |
| 1 1 1 | CLAYSTONE (SHALE): same as above; |] |
| | moist. | |
| 1 1 | | |
| 1 1 1 | 138.0-142.0' SAMPLE. | |
| † † † | Recovered $5.0/4.0^{\circ} = 125\%$. | 1 |
| _ 1 1 1 | RQD = 5.0/5.0' = 100%. CLAYSTONE (SHALE): same as above | |
| | with very fine-grained sands; moist. | |
| + + + | With very 11110 Bramea dands, motor. | |
| | 142.0-146.0' SAMPLE. | |
| TTT | Recovered $4.0/4.0^{\circ} = 100\%$. | |
| 1 1 1 | RQD = 4.0/4.0' = 100%. | |
| | 142.0-142.9': CLAYSTONE (SHALE): | |
| + + + | medium dark gray (N 4/0); some sand; massive; medium to low plastic; moist. |] |
| | 142.9-143.4': SANDSTONE: medium gray | |
| <u> </u> | (N 5/0) to medium dark gray (N 4/0); | ļ |
| + + + | fine-grained sands; moderately cemented; | |
| | poorly sorted; moist. | |
| † † † | | |
| | | |
| T T T | | .1 |
| 1 1 1 | | |
| | | 1 |

Page 12 of 16

| Coordinates N | 36442.31 E 24983.42 | Ground Surfa | ce Elevation 5947.17' |
|------------------|--|--------------------|---|
| Total Depth | 07,00' | Water Level | Encountered17.7' |
| | | | Static |
| Drilling Company | Boyles Bros | Oriller R. St | narp; P. Bushkovski |
| Date Drilled Ser | ot. 3-9: Sept. 11-15, 1987 | Helper S. Bi | radfield: K. Parker |
| Drilling Method | Hollow Stem Auger: Rotary C | ore Drilling Fluid | 0.0-55.5': None |
| | . Bergman; R.T. Treat | Checked By | 55.5'-207.0': Water |
| <u> </u> | Geologist | Checked by . | Site Manager |
| | | | CEARP Manager |
| Comments Sur | rface casing set to 55.5' by | J.B. Bergman on | |
| | • /- / | | |
| | Lithologic De | scription | Samples Collected or Other Tests Performe |
| 74.6 | ~/ ~ ~ / | | |
| | 146.0-150.5' SAMPLE. | | 1 |
| + | $\frac{146.0-130.3 \text{ SAMFLE.}}{\text{Recovered } 4.5/4.5' = 100}$ |)%. | 1 |
| 1 | RQD = 3.7/4.5' = 82%. | | 1 |
| T | T CLAYSTONE (SHALE | | |
| 1 | gray (N 4/0); massive | | |
| | T plastic; trace fine-grai | ned sand; blocky; | 1 |
| + | moist. | | |
| _ 1 | 150.5-154.5' SAMPLE. | | 1 |
| – † | Recovered $4.0/4.0' = 100$ | 0%. | |
| 1 | + RQD = 3.4/4.0' = 85%. | | 1 |
| | CLAYSTONE: same as | above; moist. | 1 . 1 |
| † | † † | | 1 |
| 1 | 154.5-159.0' SAMPLE. | | |
| Ţ | Recovered $4.5/4.5' = 100$ | 0%. | 1 |
| • 🛉 | + RQD = 4.5/4.5' = 100%. | than a tak | |
| [| CLAYSTONE: same as a | ibove; moist. | |
| | T 159.0-163.0' SAMPLE. | | |
| 1 | Recovered $4.0/4.0' = 100$ |)%. | |
| ţ | $RQD = 4.0/4.0^{\circ} = 100\%$. | • | 1 |
| † | CLAYSTONE: same as a | bove; moist. | |
| 1 | 163 0-166 0' SAMPLE | | 1 |
| Ī | $\frac{163.0-166.0'}{\text{Recovered } 1.15/3.0'} = 38$ | 196 | |
| + | + RQD = 0.5/1.15 ' = 43%. | | |
| j | CLAYSTONE: same as a | | 1 |
| | T T | | 1 |
| + . | 166.0-168.0' SAMPLE. | 20/ | 1 |
| • | Recovered $3.85/2.0^{\circ} = 19$ $RQD = 3.85/3.85^{\circ} = 1009$ | | 1 |
| † | CLAYSTONE: same as a | | 1 |
|] | I I LEATSTOILE. Same as a | , 1110131. | 1 |
| T | TT | | |
| ↓ . | ↓ ↓ | | 1 |
| | 1 1 | | 1 |
| í | 1 (| | 1 |

| | Rocky Flats Plant; East Trenches Are | | No. 28-87BR |
|------------|---|-----------------|---|
| Coordin | •t•• N 36442.31 E 24983.42 | Ground Surfac | • Elevation <u>5947.17'</u> |
| Total De | pth 207.00' | Water Level | Encountered 17.7' |
| | | | Static |
| Drilling (| Company Boyles Bros | Driller R. Sha | arp; P. Bushkovski |
| Date Dri | Illed Sept. 3-9: Sept. 11-15. 1987 | Helper S. Bra | dfield: K. Parker |
| Orilling 1 | Method Hollow Stem Auger: Rotary Core | Drilling Fluid | 0.0-55.5': None |
| Logged | By J.B. Bergman: R.T. Treat | Checked By _ | - つつ。つ'ー/U/、U'! WATET レ |
| | Geologist | | Site Manager |
| Commen | Surface casing set to 55.5' by J. | B. Bergman on S | CEARP Manager September 8, 1987. |
| | | | |
| _ | Lithologic Descr | iption | Samples Collected or Other Tests Performed |
| | 1680 1720 SANGNE | | |
| | $\frac{168.0-172.0' \text{ SAMPLE.}}{\text{Recovered } 3.9/4.0' = 98\%.}$ | | |
| | RQD = 3.9/3.9' = 100%. | | |
| | CLAYSTONE (SHALE): | medium dark | |
| | gray (N 4/0) to medium | gray (N 5/0); | |
| | trace very fine-grained medium plastic; moist. | sand; massive; | |
| | T T T T MOSTAIN Plastic, moist. | | ` |
| | 172.0-176.0' SAMPLE. | | |
| | Recovered $4.0/4.0^{\circ} = 100\%$. | • | ľ |
| | RQD = 4.0/4.0' = 100%. CLAYSTONE (SHALE): sa | | · |
| | moist. | ime as above; | 1 |
| | | | į. |
| | 176.0-180.0' SAMPLE. | | |
| | Recovered $4.0/4.0^{\circ} = 100\%$. | · · | i |
| | RQD = 3.7/4.0' = 93%. | | |
| - | + CLAYSTONE (SHALE): sa | ime as above; | 1 |
| | moist. | | |
| | 180.0-184.0' SAMPLE. | } | · |
| | Recovered $2.0/4.0' = 50\%$. | | |
| | | | |
| | CLAYSTONE (SHALE): sa | me as above; | |
| | + + + moist. | | |
| _ | 1 184.0-188.0' SAMPLE. | į | · |
| | Recovered $3.9/4.0' = 98\%$. | j | |
| | + RQD = 3.4/3.9' = 77%. | | Ì |
| | 184.0-187.3': CLAYSTONE (as above; moist. | SHALE): same | } |
| | T T as above; moist. 187.3-188.0': SANDSTONE: | medium light | |
| | gray (N 6/0) to medium | | |
| | fine-grained; trace clay; n | noderately ce- | |
| | mented; moist. | | <u>}</u> |
| | | <u></u> | |
| | | • | ege 14 of 16 |

| Location Rocky Flat | s Plant; East Trenches Ar | ea Borehole/Wei | 1 No. 28-87BR |
|-------------------------|---|---|------------------------------------|
| Coordinates N 36442 | .31 E 24983.42 | Ground Surface | e Elevation <u>5947.17'</u> |
| Total Depth 207.00 | 1 | Water Level | Encountered |
| | | | Static |
| Drilling Company Boy | les Bros | Driller R. Sh | arp; P. Bushkovski |
| | -9: Sept. 11-15, 1987 | | |
| | ow Stem Auger: Rotary Core | Delition fluid | adfield: K. Parker 0.0-55.5': None |
| | | | 55.5'-207.0': Water .A. |
| Logged By J.B. Ber | enan: K.T. Treat | Checked By _ | Site Manager |
| _ | • | | |
| - Surface | casing set to 55.5' by J | R Royaman on | CEARP Manager |
| Comments <u>Bullace</u> | easing sec to 33.3 by 0 | b. Dergman on | September 0, 1707. |
| | · / | | / |
| | Lithologic Desc | ription | Other Tests Performe |
| 74/0/0 | ^/ | | |
| | | | |
| 1 1 | 188.0-192.0' SAMPLE. | | |
| | Recovered $3.8/4.0' = 95\%$. | | |
| + + | RQD = $2.3/3.8$ ' = 61%. 188.0-191.3': SANDSTONE | · light grav (N | 1 |
| . | 7/0) to medium light gra | | 1 |
| † † | fine-grained; highly cen | | |
| 1 1 | L calcareous; massive; moist. | | |
| | 191.3-192.0': CLAYSTO | ` ' | 1 |
| - + + | medium dark gray (N 4 | | 1 |
| | blocky; medium plastic; m | oist. | 1 |
| † † | † | | |
| 1 1 | 192.0-196.0' SAMPLE. | | |
| | Recovered $4.0/4.0' = 100\%$. | | 1 |
| + + | RQD = 3.35/4.0' = 84%. 192.0-194.9': CLAYSTONE: | | |
| | except medium gray (N 5/ | | 1. |
| † † | 194.9-196.0': SANDSTONE | | |
| _ 1 1 | (N 5/0); very fine-grained | | 1 |
| | moderately cemented; mois | | |
| + + | + | | 1 |
| | 196.0-199.0' SAMPLE. | | 1 |
| † † | Recovered $3.5/4.0' = 88\%$. | | |
| 1 1 | RQD = 2.25/3.5' = 64%. | nome so observe | |
| ŢŢ | † 196.0-197.2": SANDSTONE: moist. | same as above; | |
| + + | 197.2-199.0': CLAYSTONE | (SHALE): dark | 1 |
| | gray (N 3/0); highly plastic | • | 1 |
| - † † | 1 | , | 1 |
| 1 1 | 199.0-202.0' SAMPLE. | | |
| . } | Recovered $3.0/3.0' = 100\%$. | | 1 |
| + + | + RQD = 3.0/3.0' = 100%. | | 1 |
| | CLAYSTONE (SHALE): | | |
| † † | but some very fine-grained | sanu, moist. | 1 |
| | 1 | | 1 |
| TT | T | | |
| | <u> </u> | | 15 11 |
| | | | Page 15 of 16 |

| Coordinates Total Depth Drilling Com Date Drilled Drilling Meth | N 36442.31 E 24983.42 207.00' Peny Boyles Bros Sept. 3-9: Sept. 11-15 J.B. Bergman: R.T. Treat Geologist Surface casing set to 5 | Ground Surface Water Level Driller R. S. 1987 Helper S. E. Rotary Core Drilling Fluid Checked By | Encountered 17.7' Static Sharp; P. Bushkovski Bradfield; K. Parker 0.0-55.5': None 55.5'-207.0': Water CEARP Manager |
|---|---|---|--|
| | /2./2./ | logic Description | Samples Collected or Other Tests Performed |
| | 3/0); trace ver sive; medium p 205.0-207.0' SA Recovered 2.0/ RQD = 2.0/2.0 | 3.0' = 100%. = 100%. (SHALE): dark gray (Now of the strength | - |
| _ | | | |
| - + | | | |

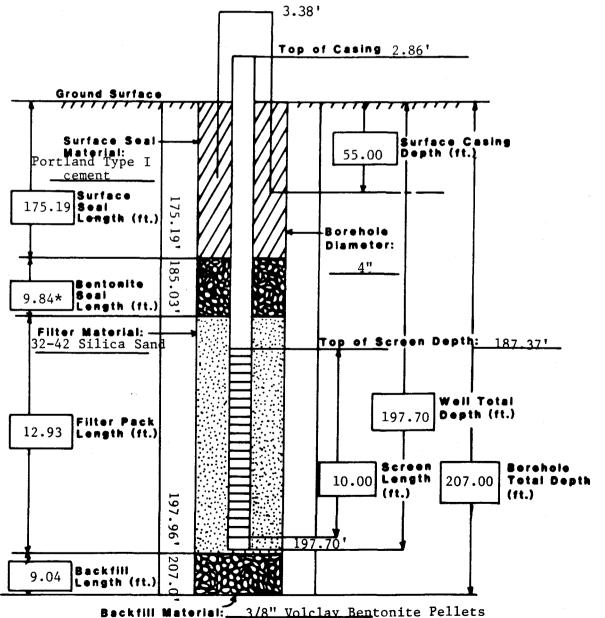
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WELL COMPLETION INFORMATION

Location Rocky Flats Plant: East Trenches Area Well No. 28-87BR Coordinates N 36442.31 E 24983.42 Elevation: Ground Surface 5947.17' Total Depth: Well 197.70' Top of Casing ____5950.03' Borehole 207.001 Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless 2" ID Casing Diameter Screen MaterialQ.010" wire wrap, type 316 TFJ Surface Casing Diamete stainless steel Date installed Sept 21-23, 1987 proved By Installed By _ K.D. Holliway Geologist Problem with sinking casing; solved by letting backfill sit overnight.

Possible caving in filter pack but above top of the screen, causing filter pack to be higher in hole. Bentonite seal was adjusted to remain 3.0'.

Possible caving in top part of bentonite seal causing seal to come higher in the hole. Note: caving was caused by tripping tremie pipe downhole. Comments 3.38'



PACKER TEST ANALYSIS WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHES JOB NO. 2029-17-02
DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST
TEST INTERVAL (FEET BELOW G.S.): 57.35 - 67.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 193.23

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00386629 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 62.17 + 10.14 + .00 * 2.31 = 72.32

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000035798 FT/MIN
 K = .00000182 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00100929 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 62.17 + 5.63 + 11.50 * 2.31 = 94.37

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000007161 FT/MIN K = .00000036 CM/SEC

2ND P1/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000001682 FT/MIN K = .00000009 CM/SEC

PACKER TEST ANALYSIS WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHES JOB NO. 2029-17-02
DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST
TEST INTERVAL (FEET BELOW G.S.): 62.68 - 72.33
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 193.23

$$K = \frac{Q}{2(PI)(L)(H)} L (--)$$

1ST P1/3 TEST

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000053 FT/MIN K = .00000027 CM/SEC

2ND P1/3 TEST

PACKER TEST ANALYSIS WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHES JOB NO. 2029-17-02 DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 78.70 - 88.35 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 193.23

$$K = ----- LN(--)$$

 $2(PI)(L)(H)$ R

1ST P1/3 TEST

P2/3 TEST

Q = INJECTION RATE = .00042717 (FEET3/MIN)L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.52 + 5.63 + 16.50 * 2.31 = 127.27

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002247 FT/MIN K = .00000011 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013322 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.52 + 9.90 + .00 * 2.31 = 93.42

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000955 FT/MIN K = .00000005 CM/SEC

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02
DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST
TEST INTERVAL (FEET BELOW G.S.): 88.35 - 98.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 193.23

$$K = \frac{Q}{2(PI)(L)(H)} LN(--)$$

1ST P1/3 TEST

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .0000009087 FT/MIN K = .00000046 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00006227 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 93.18 + 10.02 + .00 * 2.31 = 103.20
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000404 FT/MIN<math>K = .00000002 CM/SEC PACKER TEST ANALYSIS WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHES JOB NO. 2029-17-02
DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 98.00 - 107.65

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 193.23

1ST P1/3 TEST

P2/3 TEST

Q = INJECTION RATE = .00038808 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 102.82 + 5.63 + 21.00 * 2.31 = 156.96

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN K = .00000008 CM/SEC

2ND P1/3 TEST

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02

DATE TESTED: 9/17/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 100.35 - 110.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 193.23

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

P2/3 TEST

2ND P1/3 TEST

Q = INJECTION RATE = .00005068 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 105.18 + 9.94 + .00 * 2.31 = 115.12

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000295 FT/MIN

K = .00000001 CM/SEC

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02 DATE TESTED: 9/16/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 183.39 - 193.04

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 193.23

1ST P1/3 TEST

Q = INJECTION RATE = .00007964 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 188.21 + 9.29 + .00 * 2.31 = 197.50

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000270 FT/MIN K = .00000001 CM/SEC

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02 DATE TESTED: 9/16/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 185.39 - 195.04

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 193.23

K = ---------- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00000290 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 190.21 + 10.03 + .00 * 2.31 = 200.24

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000010 FT/MIN

K = .00000000 CM/SEC

PACKER TEST ANALYSIS WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02 DATE TESTED: 9/16/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 187.54 - 197.19

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 193.23

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 192.36 + 9.50 + .00 * 2.31 = 201.86

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000192 FT/MIN K = .00000001 CM/SEC

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02 DATE TESTED: 9/16/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 183.37 - 193.02

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 193.23

K = ---- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00001086 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 188.20 + 9.61 + .00 * 2.31 = 197.81

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000037 FT/MIN K = .00000000 CM/SEC

WELL NO. 28-87BR

ROCKY FLATS PLANT; EAST TRENCHE JOB NO. 2029-17-02

DATE TESTED: 9/16/87 BY: L.A. GREGORY-FROST

TEST INTERVAL (FEET BELOW G.S.): 187.55 - 197.20

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 193.23

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00034908 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 192.38 + 10.07 + .00 * 2.31 = 202.45

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001155 FT/MIN

K = .00000006 CM/SEC

| | | | | PACKE | ER TEST [| DATA SH | SHEET | | | | |
|----------------------|-------------------------|-----------------------------------|--------------------------|---------|----------------|--------------|------------------------------------|---------|-------------|--|-----------|
| Job No.: | 2029-17-02 | 2 | | | | | | | Static Wa | Static Water Level: 193.23 | 93.23' |
| Location: | Rocky Fla | Location: Rocky Flats Plant; East | ast Trenches | es Arca | | | | | Date of W | Date of Water Level: 10/26/87 | 10/26/87 |
| Well No.: | 28-87BR | | | | | | | | Page | 013 | |
| Borehole | ame ter: | 0.333' | | °C | Comments: T | ⊆1 | #1-6 | (3) | ssure t | | . |
| Across T | | r. 0.1663' | | | σ. <u>Ι</u> φ. | packer sear. | packer | Tests | #7,6, 13-13 | #7,5, 13-13 were aborted #9-12, 16 are invalid due | d due to |
| | | | | | [3 | water gain | in tube on | first 1 | 3 pressure | test. | ı |
| Test Interval No. | Top of Test Interval | Bottom of Test Interval | Test Length (minutes) | Gege | Gage Height | | Gage Helght +Avg. H2O Height | Δħ | | Libratogy | Geologist |
| 1 | 187.55 | 197.2 | 14 | 0 | 5.63 | 4.44' | 10.01 | 0.225 | 9/16/87 | Kass | LAG |
| | | | 1 | 42 | 5.63 | N/A | 5.63 | I | 9/16/87 | Kass | LAG |
| | | | ı | - | 5.63 | 1 | 1 | i | 9/16/87 | Kass | LAG |
| 2 | 183.14 | 192.79 | 14 | 0 | 5.63 | 4.34 | 9.97 | -0.024 | 9/16/87 | KCL | LAG |
| | | | 1 | 41 | 5.63 | • | - | - | 9/16/87 | KCL | LAG |
| | | | - | 1 | 5/63 | 1 | ı | 1 | 9/16/87 | KCL | LAG |
| 3 | 183.37 | 193.02 | 14 | 0 | 5,63 | 3,985 | 9.615 | 0.007 | 9/16/87 | Kass/KCL | LAG |
| | | | 1 | 40.5 | 5.63 | 1 | 1 | ļ | 9/16/87 | Kass/KCL | LAG |
| | | | 1 | 1 | 5.63 | • | | - | 9/16/87 | Kass/KCL | LAG |
| 4 | 187.54 | 197.19 | 15 | 0 | 5.63 | 3.87 | 9.5 | 0.04 | 9/16/87 | Kass/KCL | LAG |
| | | | ı | 1 | 5.63 | 1 | 1 | 1 | 9/16/87 | Kass/KCL | LAG |
| | | | - | i | 5.63 | ı | ı | 1 | 9/16/87 | Kass/KCL | LAG |
| 5 | 185.39 | 195.04 | 15 | 0 | 5.63 | 4.54 | 10.03 | 0.002 | 9/16/87 | KCL | LAG |
| | | | ij | 42 | 5.63 | 1 | 1 | 1 | 9/16/87 | KCL | LAG |
| | - | | 1 | 1 | 5.63 | ı | - | ı | 9/16/87 | KCL | LAG |
| 9 | 183.39 | 193.04 | 15 | 0 | 5.63 | 3.66 | 9.29 | 0.055 | 9/16/87 | KCL | LAG |
| | | | 1 | 41.5 | 5.63 | 1 | ĵ | i | 9/16/87 | KCL | LAG |
| | | | ļ | ı | 5.63 | I | ı | 1 | 9/16/87 | KCL | LAG |
| | | | · | | | | | | | | |

Date of Water Level: 10/26/87 Static Water Level: 193.231 PACKER TEST DATA SHEET Location: Rocky Flats Plant; East Trenches Area Well No.: 28-87BR (CON'T) Job No.: 2029-17-02

| 1 | |
|-------|--------|
| -01-3 | |
| 190 2 | |
| Pa | |
| | |
| | |
| | |
| | |
| | nents: |
| | Com |

Acrylic Tube Diameter: 0.16631

Borehole Diameter: 0.333'

| | | | . | | ı | | | | | | |
|----------------------|-------------------------|----------------------------|--------------------------|------------------|-------------|---------------------------------|------------------------------------|--------|--------------|-----------|-----------|
| Test Interval No. | Top of Teet Interval | Bottom of Test Interval | Teet Length (minutes) | Gege Preseure | Gage Height | Ave. H ₂ O Height | Gage Heart + Avg. H20 Helant | 40 | Date of Test | Libration | Geologist |
| 7 | 180.61 | 190.26 | Aborted | 4 | 5.63 | 1 | 1 | 1 | 9/16/87 | KCL | LAG |
| | | | Aborted | i. | 5.63 | 1 | ļ | 1 | 9/16/87 | KCL | LAG |
| | | | Aborted | t | 5.63 | 1 | 1 | 1 | 9/16/87 | KCL | LAG |
| 8 | 178.61 | 188.26 | Aborted | ı | 5.63 | **** | - | 1 | 9/16/87 | KCL | LAG |
| | | | Aborted | _ | 5.63 | 1 | 1 | 1 | 9/16/87 | KCL | LAG |
| | | | Aborted | ı | 5.63 | 1 | l | • | 9/16/87 | KCL | LAG |
| 6 | 100.35 | 110.00 | 15 | 0 | 5.63 | 3.89 | 9.52 | -0.033 | 9/17/87 | KCL | LAG |
| | | | 15 | 21.5 | 5.63 | N/A | 5.63 | -0.587 | 9/11/87 | KCL | LAG |
| | | | 15 | 0 | 5.63 | 4.311 | 9.94 | 0.035 | 9/17/87 | KCL | LAG |
| 10 | 98.0 | 107.65 | 15 | 0 | 5.63 | 4.05 | 89.6 | -0.055 | 9/17/87 | KCL | LAG |
| | | | 15 | 21 | 5.63 | N/A | 5.63 | 0.268 | 9/17/87 | KCL | LAG |
| | | | 15 | 0 | 5.63 | 4.02 | 9.65 | -0.010 | 9/17/87 | KCL | LAG |
| 11 | 88.35 | 98.0 | 15 | 0 | 5.63 | 4.03 | 99.6 | -0.192 | 9/11/87 | KCL | LAG |
| | | | 15 | 18.75 | 5.63 | N/A | 5.63 | 1.332 | 9/11/87 | KCL | LAG |
| | | | 15 | 0 | 5.63 | 4.39 | 10.02 | 0.043 | 9/17/87 | KCL | LAG |
| 12 | 78.70 | 88.35 | 15 | 0 | 5.63 | 4.29 | 9.92 | -0.037 | 9/11/87 | KCL | LAG |
| | | · | 15 | 16.5 | 5.63 | N/A | 5.63 | 0.295 | 9/17/87 | KCL | LAG |
| | | | 15 | 0 | 5.63 | 4.27 | 9.90 | 0.092 | 9/11/87 | KCL | LAG |
| | | | | | | | | | | | |

Date of Water Level: 10/26/87 Static Water Level: 193,231 Page 3 of 3 PACKER TEST DATA SHEET Comments: Location: Rocky Flats Plant: East Trenches Area Acrylic Tube Diameter: 0,1663 0.333 Well No.: 28-87BR. (CON'T) Borehole Diameter: ____ Job No.: 2029-17-02

| Test Interval | Top of Test | Bottom of | Test Length | 0.00 | Gage Height | Ave. M20 | Gage Helekt | ٩٥ | Date of Test | Librategy | Geologiet |
|---------------|-------------|-----------|-------------|------|-------------|----------|-------------|--------|--------------|-----------|-----------|
| | | | | | | | | | | | |
| 13 | 50.60 | /8./0 | Aported | 1 | • | | ` | 1 | 9/11/87 | | LAG |
| | | | Aborted | 1 | | ı | 1 | ı | 9/17/87 | | LAG |
| | | | Aborted | - | 1 | ŀ | - | 1 | 9/17/87 | | LAG |
| 14 | 67.05 | 76.70 | Aborted | • | | 1 | 1 | ţ | 9/17/87 | | LAG |
| | | | Aborted | ŀ | • | t | 1 | l | 9/11/87 | | LAG |
| | | | Aborted | - | ì | • | 1 | l | 9/17/87 | | LAG |
| 15 | 64.58 | 74.23 | Aborted | - | ١ | 1 | 1 | l | 9/11/87 | | LAG |
| | | | Aborted | - | 1 | 1 | - | Į. | 9/11/87 | | LAG |
| | | | Aborted | - | ١ | | 1 | - | 9 /17/87 | | LAG |
| 16 | 62.68 | 72.33 | 15 | 0 | 5.63 | 4.06 | 69.6 | -0.402 | 9/11/87 | KCL | LAG |
| | | | 15 | 12.5 | 5.63 | N/A | 5.63 | 0.562 | 9/11/87 | KCL | LAC; |
| | | | 15 | 0 | 5.63 | 3.97 | 9.60 | -0.070 | 9/17/87 | KCL | LAG |
| 17 | 57.35 | 67.00 | 15 | O | 5.63 | 4.51 | 10.14 | 0.178 | 9/17/87 | KCL | LAG |
| | | | 15 | 11.5 | 5.63 | N/A | 5.63 | 0.697 | 9/17/87 | KCIL | LAG |
| | | | 15 | 0 | 5.63 | 4.27 | 9.90 | 0.125 | 9/11/87 | KCL | LAG |
| | | | | | | | | | | | |
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